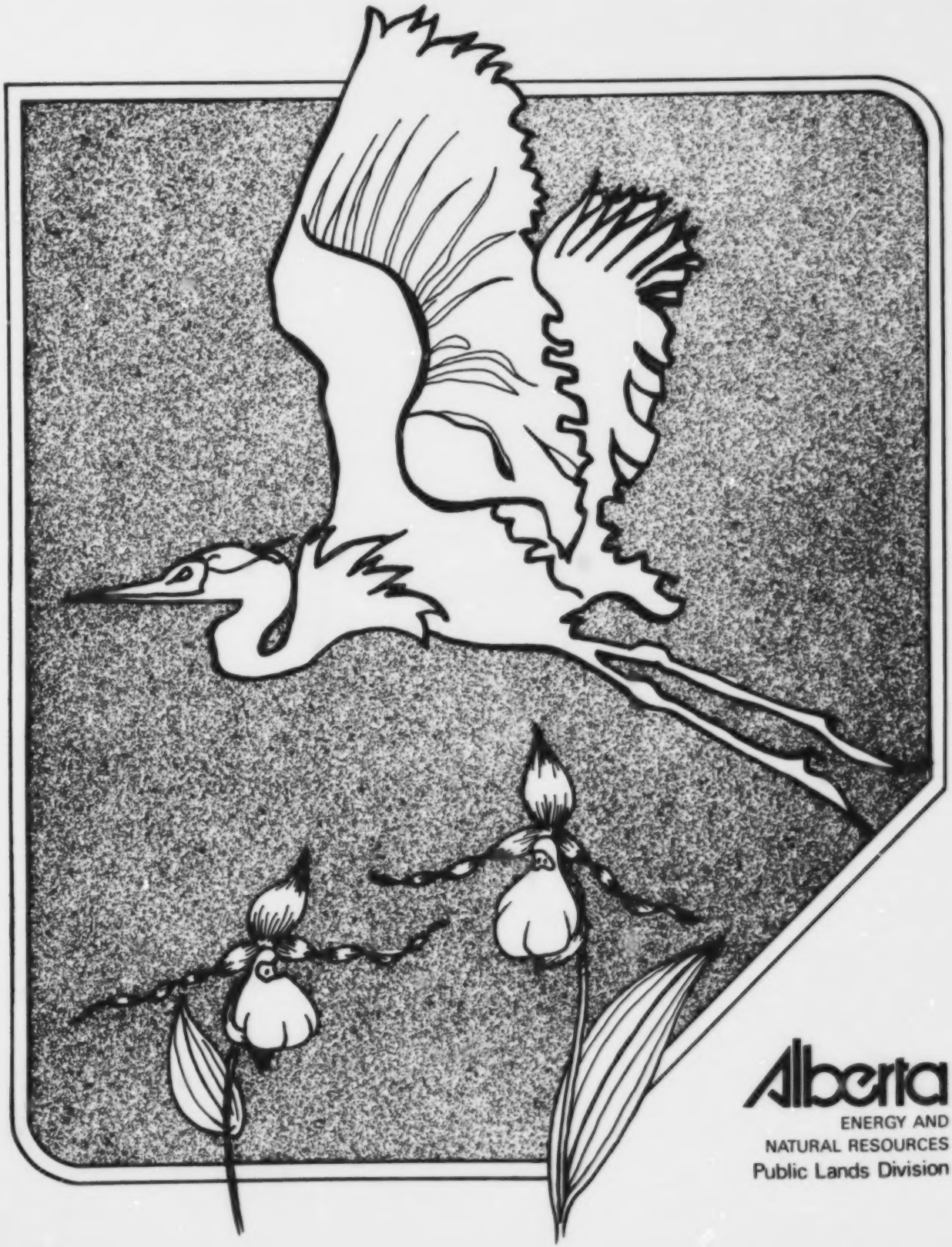
KAZAN UPLAND RESOURCE ASSESSMENT
for Ecological Reserves Planning in Alberta



Alberta
ENERGY AND
NATURAL RESOURCES
Public Lands Division

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For Ecological Reserves Planning

in Alberta

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ABSTRACT

This report provides a summary of the botanical and wildlife studies conducted in 1983 in the Kazan Upland of northeastern Alberta, primarily in the Wylie Lake and Colin Lake-Woodman Lake areas. Climate, geology, topography, and hydrology are summarized from published literature. Vegetation descriptions are provided for both special and representative types. Wildlife is described according to habitat types. Annotated lists and analyses of the flora and wildlife are included. Numerous range extensions of plants and animals are noted, including new plants and a new breeding bird species for Alberta.

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1. INTRODUCTION

This report summarizes the findings of the July, 1983 field research conducted on the vegetation and wildlife in the Kazan Upland of the Canadian Shield natural region. In addition, a general overview of the Kazan Upland geology, climate, topography and hydrology is provided from published literature. Much of this portion of the report is derived from Bradley (1978).

The Canadian Shield extends only peripherally into Alberta. The region comprises two vastly differing sections: the Kazan Upland which includes most of the Canadian Shield north of Lake Athabasca, and the Athabasca Plain which includes part of the north shore of Lake Athabasca and the Canadian Shield south of Lake Athabasca. Surficial materials in the Kazan Upland range from early Precambrian igneous and metamorphic rocks to sand plains and peatlands. Bedrock plays a major role in the landscape appearance and in determining the biological character. There is generally low relief and there are numerous lakes.

The study area includes all of that portion of the Kazan Upland section of the Canadian Shield natural region which lies in Alberta. This excludes areas of Precambrian Shield rock outcrops which are found in the Peace River Lowlands section of the Boreal Forest natural region along the Slave River and in the Peace-Athabasca delta. It also excludes portions of the north shore of Lake Athabasca and an area of crag and tail, both of which are included in the Athabasca Plain section of the Canadian Shield natural region. The Kazan Upland encompasses approximately 9000 km^2 of Precambrian Shield in the extreme northeastern corner of Alberta. The study area is bounded on the north by the Northwest Territories border, on the east by the Saskatchewan border, on the south by Lake Athabasca and its adjacent sand plain, and on the west by the marshy lowlands along the Slave River.

For discussion purposes, the north shore of Lake Athabasca is partially described in order to gain a better understanding of the significance and variety of the land north of Lake Athabasca.

Prior to the field season, aerial photographs of the entire Kazan Upland were studied and suitable study locations chosen, based on extent and variety of representative vegetation and on unique features. The field program first entailed a brief overflight of the entire Kazan Upland, examining principal areas of diversity, uniqueness or representativeness. On the ground, extensive and intensive sampling was undertaken to define the floral and wildlife character of the area. Most data sheets were compiled for the proposed Wylie Lake Ecological Reserve. Data sheets in the Colin Lake and Woodman Lake areas concentrated on those vegetation types which were not represented in the Wylie Lake area. Notes were kept in diary form and in daily updating lists of species. Vegetation plots varied in size but were generally 15 m^2 and circular for which visual estimates of cover were recorded.

Because of access problems, not all potential sites were ground-truthed; however, it is felt that, with the exception of a few special features, all principal vegetation types of the Kazan Upland have been surveyed and described.

2. CLIMATE

The climate of the Canadian Shield is cool and subhumid. Winters in the Kazan Upland are long and cold, while summers are relatively short and warm. The only climatic data available is from Fort Chipewyan but the data is long-term (Atmospheric Environment Service, 1883-present). There is some modification of the climate adjacent Lake Athabasca so the applicability of these figures to the remainder of the Kazan Upland is unclear.

The January mean maximum and minimum temperatures are -21°C and -30°C, while the July mean maximum and minimum temperatures are 22°C and 11°C. The extreme maximum temperature was 34.4°C while the extreme minimum was -51.1°C. The yearly temperature may range as much as 80°C. On average the mean daily minimum is above freezing (0°C) from mid-May to mid-September. Temperatures below 0°C in July, while rare, occur with more regularity than is evident from the mean temperature data. Break-up in water bodies is in early May and freeze-up begins in late October (Wuetherick 1971). Floes of ice on the lakes may still be present until mid-June. Snow patches were observed in a steep-sided ravine south of Waugh Lake in the first week of 1983 while doing aerial reconnaissance.

February and March are the driest months and July and August are the wettest. The period from December to April inclusive is characterized by low precipitation. The mean total annual precipitation is 33.5 cm. The mean annual snowfall is 129.6 cm and the mean annual rainfall is 20.5 cm.

Records indicate that the prevailing wind direction is from the east (33% of the time at an average speed of 12 km/h). Winds from the northwest occur only slightly less frequently (29% of the time) and at only a slightly higher speed (13.5 km/h). The maximum observed hourly speed is 64 km/h from the west-southwest with a maximum observed gust of 91 km/h. It is calm 17% of the time.

3. GEOLOGY

3.1 Bedrock Geology

The bedrock geology of the Kazan Upland has been mapped by Godfrey and Langenberg (1978). Their map is accompanied by a concise summary of the geology of the area, from which much of the following discussion is derived.

The distinctive feature is the frequent outcropping of acidic early Precambrian rocks. The bedrock plays a direct role in vegetation composition because of the extent of the outcropping and its acidic nature. The Shield in northeastern Alberta is dominated by a complex of crystalline plutonic igneous and metamorphic rocks. This mixture forms the westernmost part of the Churchill structural province of the Canadian Shield. The average composition ranges between granite and granodiorite. Granitoids compose some 65% of the outcrops of the Shield in Alberta. Granitic gneisses make up about 25% and metasediments 10% of the bedrock outcrops.

The predominant rocks are distributed in three major north-south trending belts: the western granitoids, the eastern granitoids, and the central granitic gneisses. Each belt contains minor amounts of other rock groups. Topographic linears are related to regional faults and bands of relatively soft metasediments.

The greatest portion of the area is covered with younger granitoid rocks, including biotite granites, leucocratic granites, granodiorite and quartz diorite. Along the north shore of Lake Athabasca and along some of the islands, the igneous and metamorphic rocks are overlain in a few places by sedimentary strata of Athabasca Formation sandstones. The best outcrops occur in the Fidler Point area, occupying an area of 1.5 by 0.15 km on the west side of Fidler Point. To the west, Paleozoic Devonian sedimentary rocks overlie the Precambrian formations marking the western edge of the Kazan Upland. The Precambrian formations continue to the north and to the east into the Northwest Territories and into Saskatchewan. Two structural domains have been recognized: the more westerly Leland Lake domain which appears as a predominantly granitoid group of formations, and the easterly Andrew Lake domain which is largely a granite-gneiss group of formations with subordinate granitoid components.

The greatest variety occurs along the eastern and southern parts of the Kazan Upland. The oldest group of rocks, the basement granite gneiss complex consists of granite gneisses, minor amphibolites and high-grade metasedimentary rocks. A broad band of hornblende and biotite granite gneisses trends southwest-northeast from Fort Chipewyan through Turtle Lake, Alexander Lake and Ashton Lake to west of Andrew Lake along a major fault. High-grade metasedimentary rocks occur

principally in the region northeast of Fort Chipewyan along the edge of the band of granite gneisses. These include rock types such as quartzite and biotite schist.

Metavolcanic and low-grade metasedimentary rocks (developed under low temperature conditions) occur in the Waugh Lake basin southeast of Andrew Lake. These represent the only occurrence of these rock types in Alberta. Included are basic rocks such as greenstone, basalt and gabbro, and sericitic phyllonite with phyllite and crush conglomerate. Their minerology is substantially different from any of the granitoids or granite gneisses. An amphibolite "stock" on the southeast shore of Waugh Lake may represent the remnants of the source of the Waugh Lake metavolcanic deposits (John Godfrey, June 1983, personal conversation).

The Wylie Lake area encompasses a variety of granite gneiss and granitoid rocks. The uplands adjoining the western and northwestern parts of Wylie Lake are dominated by biotite granite gneiss while the eastern and southern adjoining uplands are characterized by granitoids, such as granodiorite and quartz diorite, and by bands of high-grade metasedimentary rocks (mostly quartzite).

The Colin Lake area is represented primarily by granodiorite, while further west in the Woodman Lake area, biotite granite gneisses predominate.

3.2 Surficial Geology

During glaciation, soil was completely removed from most of the surface and there were no large or continuous deposits left by ice as the glaciers receded. This produced highly-polished grooved rock surfaces with little or no soil development and gives the region much of its open vegetation. The scouring of numerous depressions, the disruption of old drainage patterns, and the removal of the fine materials which, when carried by water, could act as erosional agents has accentuated the lack of floristic variety and retarded the development of integrated drainage systems. At the same time there has been extensive development of lake, pond and shore vegetation and of wide expanses of bog and swamp (Raup 1946).

Glacial deposits include till, glaciofluvial and glaciolacustrine deposits, all of which are sandy or gravelly. In places the bedrock is covered with a morainal veneer or blanket and there are rock knobs. Extensive areas of glaciofluvial sands are found in the vicinity of Cornwall Lake, Colin Lake and Andrew Lake; sand dunes (predominantly longitudinal) have developed in the first two areas and in the Hooker Lake district. Numerous kettles occur in the Woodman Lake - Colin Lake sand plain. Minor sand plains are found along the southeast arm and at the eastern extremity of Wylie Lake. Outwash sands cover the islands in Lake Athabasca and portions of the north shore. Long linear features which run north-south through the central and western regions and previously mapped as eskers are more likely moraines (J. Godfrey, June 1983, personal conversation). The Kazan Upland section is riddled with rocky-shored lakes filling bedrock depressions.

The east shoreline of many lake basins tends to be bevelled while the west one is steep. Sandy east shores and shoals are commonly developed on many of the larger lakes which have a broad east-trending expanse. Outstanding examples are Cornwall, Colin, Burstall, and Andrew.

The distribution and alignment of lakes are controlled by rock structure and type, modified by glaciation. Weaker rocks and fracture zones have been scoured out by glacial erosion.

3.3 Topography and Hydrology

Three topographic units can be recognized in the area east of the Slave River and north of Lake Athabasca. The western lowland unit along the Slave River consists of extensive wetlands with isolated rock outcrops and appears to be an intergrade between the Kazan Upland and features of the Peace River Lowlands section of the Boreal Forest natural region. There is little topographic variety; elevations range from 202 m east of Fort Smith to about 265 m on some of the highest portions. Slow-moving streams, Ryan Creek, La Butte Creek, Bocquene River and Dog River, rise in lakes at the western edge of the Kazan Upland and drain westward into the Slave River.

The southern lowland unit along the north shore of Lake Athabasca is part of the Athabasca Plain and consists of a narrow to broad sandy plain with locally well-developed abandoned shorelines. The elevation is 209 m at Lake Athabasca. Significant embayments, most notably those at Fidler Point and Grey Willow Point, are found along the shoreline and are silting up with mud. A large sand spit has been built up at Sand Point which juts approximately 3 km into Lake Athabasca. Neither of these two units were ground-checked although aerial photographs were studied and reconnaissance flights were made.

The third and most extensive topographic unit is the Kazan Upland. It comprises Precambrian rock outcrop with a large number of glacially-scoured rock-basin lakes and numerous but relatively small wetlands. The Kazan Upland dips gently from east to west. There is no major north to south dip, except for the sharp drop-off to Lake Athabasca. The terrain is rolling, ranging upwards in elevation to a high of 401 m in the area between Colin Lake and Governor Lake. Local relief can be as much as 100 m. Steep cliffs are present along many lakes. There is little organized drainage in much of the area. Except for internal drainage, streams in the Colin Lake, Wylie Lake and north shore of Lake Athabasca districts flow into Lake Athabasca. Drainage in the Andrew Lake and Charles Lake districts is northward into the Northwest Territories. Lengthy, though not always well-developed, drainage systems in the Kazan Upland include: Leland Lakes/McLelland Lake and Cornwall Lake/Hooker Lake to Daly Lake to Myers Lake to Dog River to Slave River; Turtle Lake/Disappointment Lake to La Butte Creek to Slave River; Fletcher Lake to Ryan Lake to Ryan Creek to Slave River; and Alexander Lake to Woodman Lake to Colin Lake to Colin River to Lake Athabasca. The largest lakes are Charles, Andrew, Colin, Leland, Cornwall and Wylie.

4. VEGETATION

The Kazan Upland falls into Rowe's (1972) Northwestern Transition Section: a zone of subarctic woodland between closed coniferous forest in the south and mixed forest-tundra in the north. It is characterized by generally low relief and a shallow depth of glacial till over bedrock with a large number of water-filled depressions. Soils of the well-drained upland sites are predominantly Podzols and Regosols, while the depressions are dominated by Cryic Fibrisols. Rock outcrops are numerous. Well-drained sandy soils are common, and are a result of glacial processes and weathering on the granitic rocks of the area.

The striking differences between the portion of the Canadian Shield along the north shore of Lake Athabasca and southwards (Athabasca Plain) and the part northwards (Kazan Upland) are due directly to the presence of igneous and metamorphic rocks in the latter area. These hard rocks are so resistant to weathering that little soil has been produced since the retreat of the last glaciers. Most of the present soil has developed from localized till deposits, outwash, small alluvial deposits and organic accumulation in wetlands.

The distribution of plant communities in the Kazan Upland reflects the influences of landform and fire. Despite the variety of substrates and apparent morphological differences in the vegetation, there are surprisingly few vegetation communities within the Kazan Upland and there is little variation in species composition from site to site. Wetland vegetation can be broken up simply into three basic types: marsh, swamp and bog. Upland vegetation is composed largely of rock outcrop, pine woodland and deciduous woodland.

The vegetation is largely a mosaic of jack pine forests on sandy plains and rocky hills and black spruce bogs and sedge marshes in wet depressions. Jack pine woods have the greatest areal extent and are especially extensive on sand plains along the eastern side of the Alberta Kazan Upland. Despite previous indications, much of the rock is actually covered by a thin layer of litter and humus and extensive mats of fruticose lichens. Rock exposures are frequent but generally not extensive.

The majority of lakes in the region are mesotrophic, with a relatively low mineral content. Oligotrophic lakes occur in the deepest trenches and eutrophic lakes are common in a few shallow basins. The Kazan Upland has the highest density of lakes in the province.

4.1 Upland

4.1.1 Rock Outcrop

No continuous soil exists in the rocklands. There is a low diversity of species at any given site but a moderate richness overall in this heterogeneous vegetation. The more densely vegetated rock outcrops are transitional in character to the rocky jack pine woodlands. Lichens figure prominently in this type with Stereocaulon spp., Cetraria nivalis, Cladina mitis and Cladonia uncialis on shallow humus over rock on less exposed and less steep sites. Lichens on exposed rocks on the ridges and on steep south-facing rock slopes include Umbilicaria spp., Lecanora spp., Rhizocarpon spp. and Parmelia saxatilis.

Low and dwarf shrubs, Juniperus communis, Arctostaphylos uva-ursi, Empetrum nigrum and Vaccinium vitis-idaea, have low to moderate cover values. Other vascular plant species are confined largely to the crevices and consist primarily of Festuca saximontana, Poa glauca, Dryopteris fragrans, Cryptogramma acrostichoides, Saxifraga tricuspidata, Corydalis sempervirens, Potentilla tridentata and Solidago spathulata. Other vascular plants include: Woodsia ilvensis, Senecio streptanthifolius, Campanula rotundifolia, Ledum groenlandicum, Vaccinium myrtilloides, Alnus crispa, Amelanchier alnifolia. Mosses are scarce; Pleurozium schreberi and Polytrichum spp. occur.

Agrostis scabra is found along the edges of slight depressions in bare rock surfaces which collect rainwater and snowmelt. Gymnocarpium jessoense and Polypodium virginianum occur most frequently on north-facing slopes; the former is found in crevices on steep largely barren rock faces within a few metres of the lake level, while the latter occurs on gentler slopes with a high cover of fruticose lichens. The lichens Bryoria chalybeiformis and Caloplaca murorum appear to be most common on steep rock immediately adjacent the water line along lakes.

4.1.2 Jack Pine Woodland

Pinus banksiana woodlands are rather simple floristically compared with forests further south in the Boreal Forest region. The lists presented below represent composites of numerous sites. When any site is considered alone, it generally has few species. Raup (1946) cites an extreme but not uncommon case where, after careful examination of a large area, only six vascular species could be found among the secondary species and, over whole acres, pine is the only vascular plant. Jack pine woods can be divided into two basic types: those occurring on sandy or gravelly outwash, aeolian and till deposits, and those occurring on rocky terrain. Stable aeolian deposits are characterized by Brunisols. Glaciofluvial, ice contact and till

deposits are coarse, with Podzols the predominant soil type. Regosols are typical of the rocky uplands.

4.1.2.1 Rocky Sites. Pinus banksiana woods on rocky terrain are characterized by an open growth of relatively short (6-8 m) trees. Betula neoalaskana is locally common on the rocky terrain and even in fairly pure pine there are usually scattered birch trees. With a few exceptions other tree species, Picea mariana, Betula neoalaskana and Populus tremuloides, typically have low cover values and do not appear to be succeeding the pine. Raup (1946) noted a similar lack of successional trend and indicated that the pine appeared to be succeeding itself. This may be because of the repeated fires which rage across this region and the fact that plant growth is so slow that any regeneration of successional species is wiped out by fire before there is any real establishment.
Understory vegetation consists of a high cover of a variety of lichens, principally Cladina mitis, Cladonia uncialis and Stereocaulon spp. with Cladina alpestris and Cladina rangiferina being locally important. Rock exposures are generally covered with lichens such as Parmelia spp. and Umbilicaria spp. Rock crevices support much of the vascular plant growth. Areas of soil are small and usually comprise gravelly or sandy morainic materials. Alnus crispa is locally prevalent but never achieves cover values approaching those in the sandy pine woodlands. Dwarf shrubs, particularly Arctostaphylos uva-ursi and, to a lesser extent, Vaccinium vitis-idaea and Empetrum nigrum generally have low, but significant, cover values.

Graminoids such as Festuca saximontana, Poa glauca and Oryzopsis pungens are widespread in this type but have low cover values. Principal forbs are Potentilla tridentata, Saxifraga tricuspidata and Cryptogramma acrostichoides. Other species found here include: Lycopodium annotinum, Lycopodium complanatum, Juniperus communis, Corydalis sempervirens, Senecio streptanthifolius, Dryopteris fragrans, Polypodium virginianum, Woodsia ilvensis, Agropyron trachycaulum var. trachycaulum, Agrostis scabra, Amelanchier alnifolia, Rosa acicularis, Cornus canadensis, Orthilia secunda, Ledum groenlandicum, Vaccinium myrtilloides, Campanula rotundifolia, Antennaria neglecta, Arnica lonchophylla and Solidago spathulata.

4.1.2.2 Sandy Sites. Pine woodlands on sandy soils are often characterized by a lusher understory, the denser canopied stands often with a moderate to dense cover of Alnus crispa and Arctostaphylos uva-ursi. In more open stands there is a dense growth of lichens, mostly Cladina mitis , with a moderate cover of Empetrum nigrum, Vaccinium myrtilloides, Vaccinium vitis-idaea and Arctostaphylos uva-ursi. Other prominent lichens include: Stereocaulon spp., Cladina rangiferina, Cladina alpestris and Cetraria spp. (mostly Cetraria nivalis). There are significant patches of unvegetated ground within many stands.

Other species have relatively low cover values although Oryzopsis pungens, Lycopodium annotinum, Potentilla tridentata, Geocaulon lividum, Cornus canadensis, Aralia nudicaulis, Linnaea borealis and Maianthemum canadense are locally significant in the understory composition. Betula neoalaskana, Picea mariana and Populus tremuloides occur prominently in a few sites, the last two particularly in the Woodman Lake area. Picea glauca is prevalent on a few restricted sites on sandy soils along lakeshores.

Additional species found in these sites include: Anemone multifida, Rosa acicularis, Rubus idaeus ssp. melanolasius, Pyrola chlorantha, Orthilia secunda, Viburnum edule, Campanula rotundifolia, Arnica lonchophylla, Solidago spathulata, Lycopodium complanatum, Lycopodium obscurum, Selaginella rupestris, Juniperus communis, Agropyron trachycaulum var. trachycaulum, Festuca saximontana, Poa glauca, Carex aenea, Carex siccata, Stellaria longipes, Anemone patens, Arabis lyrata ssp. kamchatica, Amelanchier alnifolia, Fragaria virginiana ssp. glauca, Potentilla tridentata, Shepherdia canadensis, Antennaria neglecta, Antennaria rosea, Artemisia campestris, Senecio streptanthifolius, Cladonia spp., Pleurozium schreberi, Hylocomium splendens and Dicranum spp.

4.1.2.3 Burns. Where pine is burned, regeneration of the pine is moderately dense on sandy sites but sparse on rocky areas. Examination of trees by Raup (1946) showed jack pine 0.3 to 2.5 m (many only to 1 m) and 12 to 15 years old; 2 to 2.5 m and 40 years old; and 8.5 m and 120 years old. He indicated that it was apparent that fires are frequent and, although they miss significant areas, eventually most of the landscape is burned. Picea mariana, Betula neoalaskana and Populus tremuloides regeneration are also present in burned areas. Recently burned areas include several species which do not appear to be prevalent in the unburned sites. Species found here include: Carex umbellata var. tonsa, Carex deflexa, Carex aenea, Epilobium angustifolium (prominent species), Calamagrostis canadensis, Rubus idaeus ssp. melanolasius, Ledum groenlandicum (prominent species), Salix pyrifolia and Hudsonia tomentosa; and species which are common in other pine woods such as: Alnus crispa, Agrostis scabra, Potentilla tridentata, Festuca saximontana, Oryzopsis pungens, Empetrum nigrum, Linnaea borealis, Cornus canadensis (prominent species), Corydalis sempervirens, Arctostaphylos uva-ursi, Vaccinium myrtilloides (prominent species), Vaccinium vitis-idaea (prominent species), Marchantia polymorpha, Bryum spp. and Polytrichum spp.

4.1.3 Moist Deciduous Woods

On moist sheltered sites along the edges of bogs and swamps, moist stands of Betula neoalaskana occasionally occur. They are

characterized by a moderately dense canopy of birch with some Picea mariana or, more rarely, Populus balsamifera and a moderately dense understory of Alnus tenuifolia, Aralia nudicaulis and Viburnum edule. Occasionally, Alnus tenuifolia becomes dominant along the wetter edges of black spruce bogs and woodlands. Other species present are: Carex cf. loliacea, Carex norvegica, Pyrola minor, Ledum groenlandicum, Calamagrostis canadensis, Mitella nuda, Petasites palmatus, Lycopodium annotinum, Vaccinium vitis-idaea, Salix bebbiana, Viola renifolia, Trientalis europea, Dicranum spp. and Polytrichum spp.

More open wetter sites have a lusher ground cover with the following species locally common: Carex disperma, Carex vaginata, Gymnocarpium dryopteris, Smilacina trifolia, Cornus canadensis, Trientalis europea and Viola palustris. Other species found on the wetter sites are Glyceria striata, Rumex occidentalis, Ribes hudsonianum, Rubus arcticus ssp. acaulis, Rubus idaeus ssp. melanolasius, Equisetum arvense, Ranunculus lapponicus, Potentilla palustris, Impatiens spp. and Sphagnum teres.

Populus tremuloides woodlands are only extensive in the vicinity of Woodman Lake and are transitional between the wetter birch woodlands and the drier upland pine and aspen. Aralia nudicaulis and Viburnum edule are important components of these stands.

4.2 Wetland

Peatlands occur in depressions and are mostly bog types dominated by Picea mariana, Larix laricina, Ledum groenlandicum, Cladina spp. and Sphagnum spp. arranged in hummocks. The trees in these peatlands are generally short (6-10 m) and permafrost is widespread. Fens appear to be rare because of the acidic nature of the rock and surficial materials, as well as the rocky nature of the lake shores.

4.2.1 Black Spruce Bog

A Picea mariana - Ledum groenlandicum - Sphagnum fuscum community is the most commonly occurring bog vegetation. This type occupies the most filled-in depressions or the most raised areas of wetland complexes. The cover of black spruce varies from moderately dense to fairly open. Betula neoalaskana is locally significant in the overstory but never forms pure stands. Larix laricina is more prominent on slightly wetter sites where there is more surface water flow.

The understory is composed of a moderate cover of Ledum groenlandicum, Vaccinium vitis-idaea and Sphagnum spp. (mostly Sphagnum fuscum on the driest sites). Other species prominent in the drier phases are: Lycopodium annotinum, Equisetum sylvaticum,

Calamagrostis canadensis, Carex curta, Alnus crispa, Rubus arcticus ssp. acaulis, Rubus chamaemorus, Cornus canadensis, Andromeda polifolia, Kalmia polifolia, Oxycoccus microcarpus and Cladina mitis. Pinguicula villosa is a rare but characteristic species of the peat moss hummocks.

Slightly moister sites are characterized by a reduction of the previously mentioned ericaceous species and the increase in sedges and non-ericaceous shrubs: Carex paupercula, Carex curta, Carex tenuiflora, Salix glauca, Salix myrtillifolia, Salix planifolia and Betula glandulosa. Other species found here include: Petasites palmatus, Castilleja raupii, Corallorhiza trifida and Equisetum scirpoides.

Much of the variety in bogs occurs in the vicinity of wetter depressions within the bog. Chamaedaphne calyculata is prevalent on the wetter bog sites as a dominant understory species particularly in areas which are transitional to swampier conditions. Additional species found in and adjacent the wetter pools are: Equisetum fluviatile, Sparganium minimum, Glyceria borealis, Glyceria striata, Poa pratensis, Carex disperma, Carex aquatilis, Carex chordorrhiza, Carex heleonastes, Carex limosa, Carex norvegica, Eriophorum brachyantherum, Eriophorum chamissonis, Eriophorum gracile, Eriophorum polystachion, Smilacina trifolia, Petasites sagittatus, Salix pedicellaris, Stellaria longifolia, Ranunculus lapponicus, Drosera rotundifolia, Potentilla palustris, Epilobium palustre, Arctostaphylos rubra, Menyanthes trifoliata, Utricularia intermedia and Galium trifidum. Drepanocladus exannulatus is a dominant moss along with the sphagna found in the wetter sites including Sphagnum nemoreum, Sphagnum girgensohnii, Sphagnum teres and Sphagnum angustfolium.

All black spruce bogs appear to succeed to a Picea mariana - Pleurozium schreberi community. It is most common on islands and at the unburned outer margins of bogs adjacent to the rocky uplands. There are few species in this type. The only other plants with significant cover are Ledum groenlandicum and Vaccinium vitis-idaea. Other species noted here include: Lycopodium annotinum, Alnus crispa, Betula papyrifera, Equisetum sylvaticum, Equisetum scirpoides, Rubus arcticus ssp. arcticus, Rubus chamaemorus, Cornus canadensis, Cladina mitis, Cladina alpestris, Hylocomium splendens and Polytrichum commune. Corticolous lichens are most abundant in this Picea mariana - Pleurozium schreberi type.

4.2.2 Swamp

Swamps are transitional between the black spruce bog and the sedge marshes. They are characterized by a very open tree growth of Larix laricina or Picea mariana and a dense understory of low shrubs, primarily Chamaedaphne calyculata. Other prominent low shrubs include: Salix pedicellaris, Salix planifolia, Salix glauca (particularly along streams), Salix pyrifolia (especially when burned), Alnus tenuifolia (particularly along streams), Betula

glandulosa and Betula pumila (particularly along streams). Shrubs predominate along streams. Drepanocladus exannulatus and sphagna of wetter sites form a significant portion of the ground cover.

Graminoids are relatively abundant, the most prevalent are: Calamagrostis canadensis, Carex aquatilis and Carex limosa. Graminoids with less cover are: Glyceria borealis, Glyceria striata, Carex diandra, Carex disperma, Carex lasiocarpa, Carex chordorrhiza, Carex rostrata, Eriophorum chamissonis, Eriophorum gracile and Eriophorum polystachion. Potentilla palustris, Menyanthes trifoliata, Stellaria longifolia, Potentilla palustris, Rubus arcticus ssp. acaulis and Galium trifidum are common forb species in the swamps. The wet pools within the swamps are typified by: Sparganium minimum, Ranunculus circinatus, Ranunculus gmelinii, Utricularia intermedia and Utricularia vulgaris.

4.2.3 Marsh

Fairly extensive areas of marsh occur along shallow areas in sheltered bays of lakes. There are also narrow ribbons of marsh between willow and tamarack swamps and stream channels. The best development of marshes, with the exception of those along the Slave River, occurs in the Woodman Lake - Alexander Lake area. Marshes are generally characterized by distinctive stands of fairly monotypic vegetation. The deepest water is occupied by individual plants or small patches of Potamogeton praelongus and, in rare cases, by Potamogeton robbinsii and Potamogeton natans. In moderately deep water, Nuphar variegatum is dominant. Where there is considerable organic accumulation, Potamogeton alpinus forms dense stands. In shallower organic sites along lakes and streams, Potamogeton alpinus occurs in varying quantities with Potamogeton pusillus, Potamogeton richardsonii, Myriophyllum exalbescens and Ranunculus circinatus. Calla palustris and Menyanthes trifoliata occur along the edge of these stands at stream margins. Sagittaria cuneata and Hippuris vulgaris are rare components of these shallower organic sites.

Where there is less organic accumulation, and more sand or rock, dense stands of Carex aquatilis and Carex rostrata predominate in the shallower water, although there are stands of Equisetum fluviatile, Scirpus acutus, Typha latifolia and, rarely, Phragmites australis. Callitriche hermaphroditica occurs in rocky, shallow water in bays along lakes. The Carex aquatilis marshes are by far the most extensive and widespread of the marshland types, varying only slightly by the presence or absence of a few species. Other species found in the marshlands, principally in the Carex aquatilis types, are: Carex buxbaumii, Carex diandra, Carex lenticularis, Eleocharis palustris, Eriophorum gracile, Polygonum amphibium, Rumex britannica, Stellaria longifolia, Rorippa palustris, Potentilla palustris, Epilobium ciliatum, Cicuta bulbifera, Cicuta virosa, Sium suave, Lysimachia thyrsiflora, Scutellaria galericulata, Utricularia intermedia, Utricularia vulgaris, Galium trifidum and Petasites sagittatus.

4.2.4 Shore

With the exception of dense Myrica gale stands along rocky and sandy shores, most shore species occur as isolated clumps or individuals on favorable sites. Species found along rocky shores, sometimes growing in shallow water at the edge, include: Carex lenticularis, Alnus tenuifolia and Lysimachia thyrsiflora. There are few muddy shorelines; the only species found here are Ranunculus gmelinii and Rorippa palustris.

Plants growing on sandy sites are more numerous; however, there are few sandy shores which have significant vegetation cover. Species found on sandy shores are: Agropyron trachycaulum var. trachycaulum, Agrostis scabra, Calamagrostis canadensis, Hierochloe odorata, Poa pratensis, Carex aurea, Carex diandra, Carex viridula, Eleocharis palustris, Juncus alpinoarticulatus, Juncus brevicaudatus, Juncus vaseyi, Salix planifolia, Salix pyrifolia, Ranunculus reptans, Rorippa palustris, Parnassia palustris, Potentilla arguta, Potentilla norvegica, Viola palustris and Epilobium palustre.

4.3 Special Habitats

4.3.1 Grassy Slopes

In the vicinity of Colin Lake and Woodman Lake, steep grassy south-facing slopes have developed on gravelly and sandy till along the major lakes and around a few kettle ponds. These appear to be the only locations for this grassland vegetation in the Kazan Upland of Alberta. These slopes rise as much as 30 m above the lake level. The vegetation on the slopes is a mosaic of grass, shrub and forb communities. The most widespread type is dominated by Artemisia frigida. It is characterized by a high proportion of exposed gravelly sand and occurs on the upper levels of the slopes. Stipa curtiseta and Poa canbyi have low to moderate cover values. Other species found here include: Festuca saximontana, Selaginella rupestris, Calamagrostis purpurascens, Poa interior, Carex siccata, Carex supina ssp. spaniocarpa, Arabis holboellii var. retrofracta, Saxifraga tricuspidata, Draba nemorosa, Amelanchier alnifolia, Potentilla hookeriana, Potentilla pensylvanica, Arctostaphylos uva-ursi, Juniperus communis, Prunus pensylvanica, Artemisia campestris, Campanula rotundifolia, Senecio streptanthifolius, Anemone patens, Androsace septentrionalis and Phacelia franklinii.

Grassier sites on sandier soils on lower and mid-portions of the slopes are dominated by varying mixtures or pure stands of Festuca saximontana, Agropyron trachycaulum var. trachycaulum and var. unilaterale, Calamagrostis purpurascens, Artemisia campestris and Carex siccata. Other species found on the sandier soils are Populus tremuloides (regeneration), Prunus pensylvanica, Equisetum

pratense, Solidago nemoralis, Draba nemorosa, Oryzopsis pungens, Arctostaphylos uva-ursi, Vaccinium vitis-idaea, Rosa acicularis, Alnus crispa, Pinus banksiana, Anemone patens, Arabis hirsuta, Viola adunca, Apocynum androsaemifolium, Campanula rotundifolia, Senecio streptanthifolius, Solidago spathulata, Equisetum hyemale, Juniperus horizontalis, Chenopodium leptophyllum, Silene antirrhina, Arabis lyrata ssp. kamchatica, Elymus innovatus and Astragalus striatus (the last two in open woods on the steep grassy slopes).

Along the lower slopes is a mixture of grasses, shrubs and aspen regeneration. Shrubs found here include: Amelanchier alnifolia and Prunus pensylvanica with lesser amounts of Rosa acicularis, Ribes oxyacanthoides, Shepherdia canadensis and Cornus stolonifera. Other species occurring here are Lonicera dioica, Agropyron trachycaulum var. unilaterale and Pyrola chlorantha.

4.3.2 Rocky Islands

Much of the island vegetation has been discussed under previous headings. The predominant vegetation is black spruce - feather moss forest. Islands have a different microclimate because of the proximity of the lake. A few species which are rare in the area, most of which are rare in Alberta, occur only on these sites: Cardamine pratensis, Fragaria vesca, Potentilla multifida, Achillea sibirica and Arnica alpina ssp. attentuata = Arnica attenuata.

4.3.3 Wetland North of Colin Lake

A unique wetland occurs in a kettle depression north of the northeast arm of Colin Lake. This is a very sandy basin with pioneering vegetation on the backshore as well as along the present shoreline. On the steeper shore, open wet sand forms the lower strand; then there is a band dominated by Bryum pseudotriquetrum and Carex viridula; then a lower strand of vascular plants dominated by Carex lenticularis; then a strand dominated by Agrostis scabra; and finally the uppermost area is fairly open dry sand with Hudsonia tomentosa, Salix spp., Populus spp., Fragaria virginiana, Androsace septentrionalis, Carex umbellata and grasses (primarily Calamagrostis purpurascens).

The Carex lenticularis phase also has Carex viridula, Bryum pseudotriquetrum, Juncus brevicaudatus, Salix planifolia and Parnassia palustris as principal components. Other species found here are: Mentha arvensis, Arabis lyrata var. kamchatica, Ranunculus reptans, Eleocharis acicularis, Juncus alpinoarticulatus, Juncus filiformis, Juncus vaseyi, Carex saxatilis, Carex aurea (garberi type), Agrostis scabra and Poa pratensis.

The Agrostis scabra phase also has Parnassia palustris and Bryum pseudotriquetrum as major components. Other species found here

are Pinus banksiana (regeneration), Populus tremuloides (regeneration), Salix planifolia, Carex crawfordii, Carex aurea (garberi type), Carex lenticularis, Carex viridula, Carex alpinoarticulatus, Juncus brevicaudatus, Polygonum amphibium, Sagina nodosa, Ranunculus reptans, Hypericum majus, Mentha arvensis, Antennaria rosea, Erigeron acris ssp. politus and Hieracium umbellatum.

On one side of the pond where the shore has a gentle slope there are associations dominated by Eleocharis acicularis, Carex viridula, Ranunculus reptans, Juncus brevicaudatus and Juncus alpinoarticulatus. Other species noted on the wetter sands are Glyceria borealis and Carex cf. bigelowii.

A meadow at the edge of this wetland is dominated by Antennaria parvifolia, Salix spp. and graminoids. It is notable for the relatively dense growth of Botrychium spp. Principal species are Antennaria parvifolia, Salix planifolia, Calamagrostis canadensis and Juncus alpinoarticulatus. Other significant components are Salix pyrifolia, Stellaria longipes and Botrychium multifidum. Additional species recorded here are Populus balsamifera, Salix brachycarpa cf. var. antimima, Alnus crispa, Agrostis scabra, Poa pratensis, Carex siccata, Arctostaphylos uva-ursi, Botrychium lunaria, Polygonum amphibium, Arabis hirsuta, Viola adunca, Parnassia palustris, Fragaria virginiana, Potentilla norvegica, Androsace septentrionalis, Mentha arvensis, Campanula rotundifolia, Hieracium umbellatum and Senecio streptanthifolius.

4.3.4 Seepage Area South of Woodman Lake

A seepage area occurs at the edge of a beaver pond south of the kettle pond south of Woodman Lake. It is of interest because of several new records of species for the Kazan Upland and one species of Carex which may be new to the province. There is no defined community structure here. The dominant plants are arranged in clumps, the major ones being Carex ?, Carex capillaris, Carex interior, Eleocharis quinqueflora, Scirpus hudsonianus, Juncus alpinoarticulatus and Salix arbusculoides. Other vascular plants found here are Equisetum pratense, Equisetum scirpoides, Sparganium angustifolium, Triglochin palustris, Parnassia palustris, Poa pratensis, Carex norvegica, Carex aurea, Carex curta, Eriophorum brachyantherum, Habenaria hyperborea, Spiranthes romanzoffiana and Erigeron acris ssp. politus.

5. WILDLIFE

Zoogeographically, the Canadian Shield is somewhat of a transition zone between the Boreal Forest natural region (Canadian Zone) to its south, and the Subarctic (Hudsonian Zone) to its north. A major, albeit depauperate, boreal forest component exists in the wildlife, including:

1. Species ranging through northern Alberta and into the subarctic portion of the Northwest Territories, e.g., Black-backed Woodpecker and Swamp Sparrow, and
2. Species which reach their northern limits somewhere in the Canadian Shield, e.g., Song Sparrow and American Redstart.

Relative to the Boreal Forest natural region, wildlife in the Kazan Upland is generally depauperate in terms of population density and species diversity. This is largely attributable to the low diversity of vegetation types and to minimal vertical stratification in the vegetation, because of the scarcity of deciduous trees and undergrowth.

Several major habitats which are present further south and west, including marsh, shallow eutrophic waters, extensive swampy woodland and shrubland, and white spruce and balsam fir woods, are either absent or very restricted in the Kazan Upland. This accounts for the absence or rarity of numerous birds, such as several ducks, Common Yellowthroat, Black-capped Chickadee, Ruffed Grouse, Bay-breasted Warbler, and Golden-crowned Kinglet, and mammals such as the Least Chipmunk. Many of the species of this group occur along the Slave River, north shore of Lake Athabasca and in the Fort Chipewyan and Athabasca delta areas where the previously mentioned habitats are more prevalent.

In some cases, while it appears that the habitat requirements for a certain bird species are present, the species is still absent. This is the case for the Blackpoll Warbler, Yellow-bellied Flycatcher, Pine Siskin, and Brown-headed Cowbird. For these species, the limiting distributional factors are not readily apparent, but may include such factors as climate, elevation and day length.

Harper (1932) described a group of species which he considered to be absent from the Kazan Upland as being more limited by climate than by vegetation. It is now known, however, that some of these species do occur, but locally and in small numbers. These include Magnolia Warbler, Yellow-bellied Sapsucker and Clay-colored Sparrow. It seems that vegetation plays the key role in limiting the range of this group.

By far the most diverse land habitats for wildlife in the Kazan Upland occur along swampy stream channels and lake shores. In terms of individuals and species these areas are the most productive. Relative to the total wooded area, however, such habitats are rather local, and so are many of the species which inhabit them.

Since the turn of the last century, the incidence of forest

fires in the Kazan Upland has increased dramatically, coinciding with increased human activity in the region. For example, in northern Saskatchewan, from 1885-1944, the rate of fires increased 2.2 times over the period from 1840-1884. From 1955-1970, the rate of fires increased 3.1 times over 1840-84. This must have had a marked influence on the original balance of wildlife habitats and populations of the area.

5.1 Upland

At least 14 bird and five mammal species are associated with jackpine habitats.

Mature pine woods are frequented by Spruce Grouse, Northern Flicker, Gray Jay, Hermit Thrush, American Robin, Yellow-rumped Warbler, Chipping Sparrow, Dark-eyed Junco, Red Crossbill; and two mammals: Moose and Caribou. Mature and immature pine with an alder understory is used by the Solitary Vireo and Swainson's Thrush, respectively; and four mammals: Snowshoe Hare, American Red Squirrel, American Black Bear and Moose.

Numerous concentrations of old grouse droppings are prevalent on rock barrens in the pine woods. Some of this sign can be attributed to Spruce Grouse which utilize this habitat. However, as this species appears to be uncommon in the area, it is possible that winter use by Willow Ptarmigan also accounts for some of the droppings.

Hermit Thrush and Palm Warbler are found in immature pine stands, typical of older burns. The Orange-crowned Warbler is found in these immature pine stands in the vicinity of young birch. Mammals in these communities include the American Red Squirrel, American Black Bear and Moose.

The Common Nighthawk feeds over pine stands and probably nests in these habitats. The American Kestrel occurs in open areas.

Dead trees and invading herbs and shrubbery in recent burns are frequented by the Spotted Sandpiper (nesting), Black-backed Woodpecker, Hermit Thrush, Chipping Sparrow and Dark-eyed Junco. The Snowshoe Hare and Moose are mammals frequenting these areas.

In mature black spruce-jack pine stands that often occur on north-facing slopes, bird inhabitants are the Olive-sided Flycatcher, Gray Jay, Boreal Chickadee, Ruby-crowned Kinglet, Yellow-rumped Warbler, American Robin and Dark-eyed Junco. Mammals here include the American Red Squirrel, Wolf, American Black Bear and Moose.

Yellow-rumped Warbler, Ruby-crowned Kinglet, Hermit Thrush, Swainson's Thrush, Chipping Sparrow and Dark-eyed Junco occur in spruce-dominated woods along the Colin River, the only non-swampy stream in the area.

Several bird species show an affinity for stands of deciduous and mixed coniferous-deciduous woods. The Orange-crowned Warbler and Red-eyed Vireo are closely associated with stands of white birch, often on rocky slopes. This habitat is also used by the Solitary Vireo and Swainson's Thrush. The White-throated Sparrow, Northern Waterthrush, Tennessee Warbler and Palm Warbler occur in moister mixed woods next to water. Other species, more often associated with coniferous woods but

also occurring in the mixed woods, include the Gray Jay, Boreal Chickadee, Yellow-rumped Warbler, Solitary Vireo, Hermit Thrush and Chipping Sparrow.

Wooded islands with a definite deciduous component to the vegetation contain a distinctive collection of bird species, including the Bald Eagle, Spotted Sandpiper, Northern Flicker, Tree Swallow, American Robin, Eastern Phoebe, Yellow Warbler and Song Sparrow. The Bald Eagle (for nesting purposes) and the Song Sparrow are restricted to this woodland. The Bonaparte's Gull, Rusty Blackbird and Yellow-rumped Warbler are recorded on islands with more of a coniferous component to the woods. The Common Loon nests on the shore of wooded islands, and mergansers and other ducks possibly nest in the woods. The Spotted Sandpiper forages on the shorelines.

5.2 Wetlands

The most productive woodland habitats are black spruce dominated woods. These often have a shrubby understory and are found along lake shores and swampy stream channels. At least 16 bird species are found in these situations including: Gray Jay, Boreal Chickadee, Swainson's Thrush, Tennessee Warbler, Magnolia Warbler, Yellow-rumped Warbler, Chipping Sparrow, Bohemian Waxwing, Rusty Blackbird, Common Raven, Ruby-crowned Kinglet, Orange-crowned Warbler, Palm Warbler and White-winged Crossbill. In black spruce habitats, the Lincoln's Sparrow is found along the margins of lake shores and stream channels while the Northern Flicker occurs only along lake shores. Moose and American Beaver are mammals which make use of wooded shores.

Black spruce bog forests, especially edges, are occupied by the Spruce Grouse, Northern Flicker, Olive-sided Flycatcher, Gray Jay, Ruby-crowned Kinglet; and two mammals, the Snowshoe Hare and Moose.

The Palm Warbler, Tennessee Warbler and Moose are recorded in black spruce-tamarack wetlands.

Deciduous shrubbery, restricted mostly to swampy stream channels, is habitat for several species: the Red-winged Blackbird, Swamp Sparrow and Lincoln's Sparrow inhabit the wettest vegetation next to the water, and the American Redstart, Yellow Warbler, Alder Flycatcher, Wilson's Warbler and Clay-colored Sparrow are found farther back from the water's edge.

The Common Snipe, LeConte's Sparrow and Savannah Sparrow are inhabitants of extensive sedge wetlands; the last two species also occur in broad open wet areas along swampy stream courses. Swampy stream channels are also used by Ring-necked Duck and Mallard for nesting purposes.

Marshy shores and adjacent bog edges, around kettles and shallow lakes, are frequented by three species of shorebirds: Lesser and Greater Yellowlegs and Solitary Sandpiper. Kettle ponds with little backshore support Horned Grebes, Ring-necked Ducks, Buffleheads and Greater Scaup. The only kettle pond with an extensive sandy shore has nesting Semipalmated Plovers and Killdeer, as well as Lesser Yellowlegs, Spotted Sandpipers and a Canada Goose.

5.3 Lakes

The sandy shores of larger lakes are used very sparsely by Killdeer, Greater Yellowlegs and Spotted Sandpiper. Wolves, Common Ravens, Bald Eagles and white-headed gull species, occasionally forage along sandy shorelines.

Most lakes in the Kazan Upland are mesotrophic or oligotrophic, some are eutrophic, and a few are dystrophic. Wylie Lake and Colin Lake are mesotrophic, with a pH of 7.6 and 7.4, respectively; Woodman Lake is eutrophic, with a pH of 8.

Fishes in Wylie Lake include Northern Pike, Lake Trout, Lake Whitefish, Tullibee, Lake Chub, Northern Sculpin, Ninespine Stickleback and White Sucker. Colin Lake contains Northern Pike, Lake Trout, Lake Whitefish, Ling, White Sucker, Long-nosed Sucker, Slimy Sculpin and Tullibee. Species collected in Woodman Lake are Lake Whitefish and Northern Pike (Rhude, 1977).

Shallow eutrophic lakes are productive habitats for ducks, including Mallard, American Wigeon, Ring-necked Duck, Greater and Lesser Scaup and Bufflehead. Common Loons, Bonaparte's Gulls and white-headed gulls are found in these areas in small numbers.

Larger mesotrophic lakes contain smaller populations of ducks, but two species, the Red-breasted and Common Mergansers, are restricted to the deeper, colder waters of these environments. Mallard, Bufflehead, Common Loon, Common Tern, Herring Gull, Mew Gull, Bonaparte's Gull, Bald Eagle and Belted Kingfisher are other species which feed in larger lakes. Also foraging in larger lakes are a few species which are presumed to be non-breeders. These include Hooded Merganser, Arctic Tern, California Gull and Ring-billed Gull.

Numerous bird species forage, lounge or nest on or around small untreed rocky islands. Species nesting on small islands are Common Loon, Herring Gull and Mew Gull.

Rocky outcrops over water, and perhaps cabins on islands, are nesting sites for the Eastern Phoebe.

6. SIGNIFICANT FEATURES

The most significant areas identified include the north shore of Lake Athabasca, and grassy slopes and wetlands in the Colin Lake - Woodman Lake area. These areas include most of the highly restricted plant and wildlife species found during this and other surveys of the Canadian Shield north of Lake Athabasca (see Floral Analysis and Wildlife Analysis for further details).

Another significant feature of the Canadian Shield north of Lake Athabasca is the general presence of numerous rare or peripheral species. This is one of four major areas of peripherality in Alberta; the others are the Willmore-Kakwa area, Waterton, and the Cypress Hills-Milk River Canyon area.

Included in this discussion will be an updating of the status of several species from those ranges provided in Moss (1983). The 1983 field season yielded numerous range extensions and new species and varieties for Alberta. These conclusions are based on the available published literature. Herbaria and government files have not been accessed for this analysis. Species requiring confirmation are generally those referenced in Boivin's Flora of the Prairie Provinces or Scoggan's Flora of Canada.

The Waugh Lake area was not studied because of the extensive burn there. However, the mineralogy of the rocks is quite different here than anywhere else in the Kazan Upland of Alberta and there is the potential for a significantly different non-vascular flora. The vascular flora in the Waugh Lake area is not expected to differ greatly from that of other portions of the Kazan Upland.

6.1 North Shore of Lake Athabasca

This area has only been investigated at two sites, Shelter Point and Sand Point (Raup 1928, 1936, 1946). Field inspection during 1983 was not possible. Species which have not been found anywhere on the Canadian Shield north of Lake Athabasca except on the immediately adjacent north shore include the following 78 vascular plant species:

Lycopodium clavatum L.
Lycopodium selago L.
Selaginella selaginoides (L.) Link
Isoetes echinospora Dur.
Cystopteris fragilis (L.) Bernh.
Woodsia oregana D.C. Eat.
Sparganium fluctuans (Morong.) Robins.
Potamogeton filiformis Pers.

Bromus inermis Leyss. ssp. pumpellianus (Scribn.) Wagnon
Danthonia spicata (L.) Beauv.
Deschampsia cespitosa (L.) Beauv.
Elymus mollis Trin.
Festuca rubra L.
Glyceria pulchella (Nash) K. Schum.
Hordeum jubatum L.
Poa palustris L.
Trisetum spicatum (L.) Richt.
Carex brunnescens (Pers.) Poir.
Carex gynocrates Wormsk.
Carex leptalea Wahl.
Eriophorum viridi-carinatum (Engelm.) Fern.
Scirpus cespitosus L.
Scirpus cyperinus (L.) Kunth.
Juncus balticus Willd.
Juncus bufonius L.
Juncus nodosus L.
Allium schoenophrasum L.
Tofieldia pusilla (Mx.) Pers.
Sisyrinchium montanum Greene
Cypripedium acaule Ait.
Goodyera repens (L.) R.Br.
Habenaria obtusata (Pursh) Richards.
Salix arctica Pallas
Salix lucida Muhl.
Salix scouleriana Barr. ex Hook.
Arceuthobium americanum Nutt.
Polygonum lapathifolium L.
Rumex maritimus L.
Rumex triangulivalvis (Dans.) Rech. f.
Cerastium beeringianum C. & S.
Minuartia dawsonensis (Britt.) House
Minuartia rubella (Wahl.) Graebn.
Stellaria calycantha (Ledeb.) Bong.
Aquilegia brevistyla Hook.
Ranunculus cardiophyllus Hook.
Ranunculus pedatifidus J.E. Smith
Ranunculus pensylvanicus L.f.
Corydalis aurea Willd.
Barbarea orthoceras Ledeb.
Cardamine pensylvanica Muhl.
Drosera anglica Huds.
Potentilla anserina L.
Potentilla nivea L.
Sorbus scopulina Greene
Lathyrus ochroleucus Hook.
Geranium bicknellii Britt.
Callitriche verna L.
Chimaphila umbellata (L.) Bart.
Pyrola elliptica Nutt.
Monotropa uniflora L.
Ledum palustre L.

Vaccinium uliginosum L.
Primula mistassinica Mx.
Trientalis borealis Raf.
Gentianella amarella (L.) Borner
Stachys palustris L.
Euphrasia arctica Lange ex Rostrup
Limosella aquatica L.
Melampyrum lineare Desr.
Rhinanthus minor L.
Veronica peregrina L.
Galium boreale L.
Symphoricarpos albus (L.) Blake
Antennaria umbrinella Rydb.
Aster borealis (T. & G.)
Solidago canadensis L.
Solidago graminifolia (L.) Salisb.
Tanacetum huronense Nutt.

Uncommon or rare Alberta species which are known north of Lake Athabasca only along the north shore include:

Lycopodium clavatum L. (rare only in northeastern Alberta)
Selaginella selaginoides (L.) Link (rare only in northeastern Alberta)
Isoetes echinospora Dur.
Sparganium fluctuans (Morong.) Robins. (found only on the north shore of Lake Athabasca in Alberta)
Danthonia spicata (L.) Beauv.
Elymus mollis Trin.
Eriophorum viridi-carinatum (Engelm.) Fern. (rare only in northeastern Alberta)
Scirpus cyperinus (L.) Kunth.
Cypripedium acaule Ait.
Minuartia dawsonensis (Britt.) House (rare only in northeastern Alberta)
Barbarea orthoceras Ledeb.
Drosera anglica Huds.
Monotropa uniflora L.
Ledum palustre L.
Vaccinium uliginosum L.
Primula mistassinica Mx. (only record away from the mountains)
Limosella aquatica L. (rare only in northern Alberta)
Tanacetum huronense Nutt.

6.2 New Plant Records for Kazan Upland

In addition to the new records listed in following sections, observations and collections in 1983 for the following 16 species represent first records for the Kazan Upland in Alberta:

Typha latifolia L.
Potamogeton alpinus Balbis

Sagittaria cuneata Sheld.
Elymus innovatus Beal
Carex lasiocarpa Ehrh.
Stellaria longifolia Muhl.
Fragaria virginiana Duchesne ssp. glauca (S. Wats.) Staudt.
Cicuta bulbifera L.
Pyrola chlorantha Sw.
Lysimachia thyrsiflora L.
Trientalis europea L.
Menyanthes trifoliata L.
Utricularia intermedia Hayne
Utricularia vulgaris L.
Lonicera dioica L.
Petasites sagittatus (Pursh) A. Gray

6.3 New Plant Records for Canadian Shield

Collections from 1983 represent first records on the Canadian Shield in Alberta for the following thirty-seven species:

Equisetum hyemale L.
Equisetum pratense Ehrh.
Botrychium lunaria (L.) Sw.
Sparganium angustifolium Mx.
Potamogeton praelongus Wulf.
Potamogeton pusillus L.
Triglochin maritima L.
Triglochin palustris L.
Glyceria striata (Lam.) A.S. Hitchc.
Poa interior Rydb.
Stipa curtiseta (A.S. Hitchc.) Bark.
Carex buxbaumii Wahl.
Carex chordorrhiza L.f.
Carex interior Bailey
Carex cf. loliacea L.
Carex tenuiflora Wahl.
Carex vaginata Tausch
Eriophorum brachyantherum Trautv.
Eriophorum gracile Koch
Scirpus acutus Muhl. ex Bigel.
Scirpus microcarpus Presl.
Salix cf. brachycarpa Nutt. var. antimima (Schneid.) Raup
Betula pumila L.
Urtica dioica L. ssp. gracilis (Ait.) Selander
Anemone multifida Poir.
Ranunculus circinatus Sibth.
Arabis hirsuta (L.) Scop.
Draba nemorosa L.
Ribes lacustre (Pers.) Poir.
Fragaria vesca L.
Astragalus striatus Nutt.

Callitriche hermaphroditica L.
Myriophyllum exalbescens Fern.
Cornus stolonifera Mx.
Arctostaphylos rubra (R. & W.) Fern.
Veronica scutellata L.
Petasites palmatus (Ait.) A. Gray

6.4 New Plant Records for Northern Alberta

Collections in 1983 represent first records of four species for the northeastern quarter of Alberta:
Poa canbyi (Scribn.) Piper
Carex saxatilis L. (previous records require confirmation)
Potentilla hookeriana Lehm.
Pinguicula villosa L.

Collections in 1983 represent first records of eight species for northern Alberta north of Lesser Slave Lake:
Potamogeton natans L.
Carex bigelowii Torr. (tentative identification)
Carex deflexa Horn.
Carex heleonastes Ehrh.
Carex umbellata Schk.
Eleocharis quinqueflora (F.X. Hartm.) O. Schwarz
Rumex britannica L.
Cardamine pratensis L.

6.5 New Species and Records of Uncommon Alberta Plants

Collections were made of the following significant species:
Botrychium lunaria (L.) Sw. (scarce in northeastern Alberta)
Botrychium multifidum (Gmel.) Rupr. (uncommon in Alberta)
Potamogeton natans L. (uncommon in Alberta)
Potamogeton praelongus Wulf. (uncommon in Alberta)
Potamogeton robbinsii Oakes (second record for Alberta)
Glyceria striata (Lam.) A.S. Hitchc. (scarce in northeastern Alberta)
Carex capillaris L. (rare in northeastern Alberta)
Carex deflexa Horn. (uncommon in Alberta)
Carex interior Bailey (rare in northern Alberta)
Carex cf. loliacea L. (fourth Alberta locality)
Juncus brevicaudatus (Engelm.) Fern. (fifth Alberta locality)
Juncus filiformis L. (sixth Alberta locality)
Chenopodium leptophyllum (Nutt. ex Moq.) S. Wats. (second Alberta locality)
Cardamine pratensis L. (fifth Alberta locality)
Hypericum majus (Gray) Britt. (sixth locality)

Cicuta virosa L. (uncommon in northern Alberta)
Pinguicula villosa L. (third collection locality for Alberta)
Solidago nemoralis Ait. (rare in northern Alberta)

Species or subspecies new to Alberta are Arnica alpina (L.) Olin ssp. attentuata (J. Macoun) Maguire = Arnica attenuata Greene, and Carex supina Wahl. ssp. spaniocarpa (Steud.) Hult. A Carex collected south of Woodman Lake may represent a new species or hybrid for Alberta. A Carex bigelowii specimen was collected in the unique wetland north of Colin Lake and may represent a new Alberta record. These materials are being examined further by Carex experts.

6.6 Disjunct Plants

Species which, in Alberta, have a split distribution, occurring in the Rocky Mountain and Foothill natural regions, and in extreme northeastern Alberta in the Wood Buffalo National Park - Canadian Shield region are:

Lycopodium selago L. (north shore of Lake Athabasca only)
Cryptogramma acrostichoides R.Br.
Dryopteris fragrans (L.) Schott
Woodsia oregana D.C. Eat. (north shore of Lake Athabasca only)
Calamagrostis purpurascens R.Br.
Carex buxbaumii Wahl.
Carex saxatilis L. (also one isolated record in extreme northwestern Alberta)
Allium schoenophrasum L. (north shore of Lake Athabasca only)
Tofieldia pusilla (Mx.) Pers. (north shore of Lake Athabasca only)
Salix arctica Pallas (needs confirmation, north shore of Lake Athabasca only)
Cerastium beeringianum C. & S. (north shore of Lake Athabasca only)
Minuartia rubella (Wahl.) Graebn. (needs confirmation) (north shore of Lake Athabasca only)
Saxifraga tricuspidata Rottb.
Potentilla hookeriana Lehm.
Potentilla nivea L. (needs confirmation) (north shore of Lake Athabasca only)
Sorbus scopulina Greene (north shore of Lake Athabasca only)
Chimaphila umbellata (L.) Bart. (north shore of Lake Athabasca only)
Euphrasia arctica Lange ex Rostrup (north shore of Lake Athabasca only)
Antennaria umbrinella Rydb. (north shore of Lake Athabasca only)

Species which, in Alberta, have a split distribution, occurring in the extreme northeast in the Wood Buffalo National Park - Canadian Shield region and in southern localities south of Lesser Slave Lake or in grassland and parkland areas, including the Peace River Parkland, are:

Poa canbyi (Scribn.) Piper (grassland/parkland species)
Carex viridula Mx. (wetland species)

Eleocharis quinqueflora (F.X. Hartm.) O. Schwarz (wetland species)
Scirpus cespitosus L. (wetland species)
Scirpus hudsonianus (Mx.) Fern. (wetland species)
Ranunculus cardiophyllus Hook. (needs confirmation, grassland/parkland species)
Ranunculus pedatifidus J.E. Smith (grassland/parkland species)
Heuchera richardsonii R.Br. (grassland/parkland species)
Potentilla pensylvanica L. (grassland/parkland species)

6.7 Plants Confined to the Canadian Shield

Species which, in Alberta, are largely confined to the Canadian Shield, mostly north of Lake Athabasca, are:

Selaginella rupestris (L.) Spring (isolated station along the North Saskatchewan River)
Gymnocarpium jessoense (Koidz.) Koidz.
Polypodium virginianum L. (isolated station along the Clearwater River)
Woodsia ilvensis (L.) R.Br. (isolated station along the Clearwater River)
Carex lenticularis Mx.
Silene antirrhina L.
Potentilla multifida L.

6.8 Significant Wildlife

There are significant wildlife habitats which support bird species that are of local occurrence in the region. These include kettle ponds (harboring the Semipalmated Plover and Horned Grebe), deciduous woods (home for the Red-eyed Vireo and Yellow-bellied Sapsucker), eutrophic lakes such as Woodman Lake (the only places where several waterfowl species thrive), and islands (nesting sites for the Mew Gull and Song Sparrow).

The great abundance of undisturbed lakes and islands accounts for a relatively high breeding density of Bald Eagles (highest in the province) and Common Loons. Steep cliff exposures in the southern portion of the Kazan Upland provide nesting habitat for localized populations of Golden Eagles (rare in northern Alberta) and Peregrine Falcons (rare and endangered).

The Subarctic component, mostly water birds or winter visitors, is made up of species which normally range north of the Boreal Forest. Six Subarctic species were recorded during the 1983 study: Semipalmated Plover (second nesting record for Alberta), Mew Gull (first two nesting records for Alberta), Arctic Tern, Red-breasted Merganser, Greater Scaup and Least Sandpiper.

Five additional Subarctic species or races have been reported in the Alberta Kazan Upland including the Arctic Loon (nesting), Surf

Scoter (Lake Athabasca), Willow Ptarmigan (winter), Arctic Fox (winter) and Caribou (Barren-ground race - winter).

Seven additional Subarctic species or races have been reported in the Saskatchewan Canadian Shield and may be found in the Kazan Upland of Alberta. These include the Common Redpoll, Pine Grosbeak, Rock Ptarmigan (winter), Red-necked Phalarope (Athabasca Plain - nesting), Red-throated Loon (Athabasca Plain - nesting), Parasitic Jaeger (Lake Athabasca) and Horned Lark (hoyti subspecies - Athabasca Plain).

In Alberta, subarctic species are known to occur during the breeding season only locally, and are characteristic only of the Canadian Shield, Cameron Hills and Caribou Mountains.

7. FLORAL ANALYSIS

Over 315 species of vascular plants have been recorded in the Canadian Shield north of Lake Athabasca. Of these, 239 are found in the Kazan Upland part.

Sixty-eight of the native species recorded north of the north shore of Lake Athabasca in the Kazan Upland of Alberta have not been noted at Wylie Lake. Of these, the following are found on the grasslands and open woods on the steep south-facing slopes in the Colin Lake-Woodman Lake regions:

Equisetum hyemale L.
Equisetum pratense Ehrh.
Juniperus horizontalis Moench
Elymus innovatus Beal
Poa canbyi (Scribn.) Piper
Poa interior Rydb.
Stipa curtiseta (A. S. Hitchc.) Bark.
Carex supina Wahl. ssp. spaniocarpa (Steud.) Hult.
Chenopodium leptophyllum (Nutt. ex Moq.) S. Wats.
Silene antirrhina L.
Arabis holboellii Hornem. var. retrofracta (Grah.) Rydb.
Draba nemorosa L.
Ribes oxyacanthoides L.
Potentilla hookeriana Lehm.
Potentilla pensylvanica L.
Astragalus striatus Nutt.
Viola adunca J. E. Smith
Androsace septentrionalis L.
Cornus stolonifera Mx.
Pyrola chlorantha Sw.
Apocynum androsaemifolium L.
Phacelia franklinii (R.Br.) A. Gray
Lonicera dioica L.
Solidago nemoralis Ait.

The following non-Wylie Lake species are found at the unique wetland north of Colin Lake:

Botrychium lunaria (L.) Sw.
Botrychium multifidum (Gmel.) Rupr.
Carex cf. bigelowii
Carex crawfordii Fern.
Carex saxatilis L.
Eleocharis acicularis (L.) R. & S.
Juncus brevicaudatus (Engelm.) Fern.
Juncus filiformis L.
Salix cf. brachycarpa Nutt. var. antimima (Schneid.) Raup

Sagina nodosa (L.) Fenzl.
Arabis hirsuta (L.) Scop.
Hypericum majus (Gray) Britt.
Viola adunca J. E. Smith
Androsace septentrionalis L.
Antennaria parvifolia Nutt.
Erigeron acris L. ssp. politus (E. Fries) S. & K.
Hieracium umbellatum L.

The following non-Wylie Lake species are found in the unique seepage area by the beaver pond south of Woodman Lake:
Equisetum pratense L.
Sparganium angustifolium Mx.
Triglochin palustris L.
Carex sp. (possibly new for Alberta - awaiting identification)
Carex capillaris L.
Carex interior Bailey
Eleocharis quinqueflora (F.X. Hartm.) O. Schwarz
Scirpus hudsonianus (Mx.) Fern.
Habenaria hyperborea (L.) R.Br.
Salix arbusculoides Anderss.

The following species occur in the extensive wetlands north and south of Woodman Lake:
Rumex britannica L.
Cicuta virosa L.
Arctostaphylos rubra (R. & W.) Fern.
Veronica scutellata L.
Senecio indecorus Greene

The following species occur in the southeast arm of Colin Lake on an island or in moderately deep water in a sheltered bay:
Potamogeton natans L.
Potamogeton robbinsii Oakes
Cardamine pratensis L.
Antennaria parvifolia Nutt.

The remaining species have been noted in only one locality each. Although some represent range extensions into the Canadian Shield or Kazan Upland, none are considered highly significant from a provincial perspective:
Lycopodium obscurum L.
Potamogeton gramineus L.
Carex lasiocarpa Ehrh.
Scirpus microcarpus Presl.
Urtica dioica L. ssp. gracilis (Ait.) Selander
Polygonum douglasii Greene
Heuchera richardsonii R.Br.
Ribes glandulosum Grauer
Ribes lacustre (Pers.) Poir.
Pyrola asarifolia Mx.
Achillea millefolium L.
Senecio congestus (R.Br.) DC.

It is apparent that the Wylie Lake area contains most of the representative Kazan Upland plant species. With the exception of some species found on a rocky island in the northwest arm of Wylie Lake, all the species found in the Wylie Lake area have been found in the "island" of land which lies between the easternmost end of Wylie Lake and the unnamed lake to the north, including adjacent islands and a portion of the burn which lies immediately south of this area. This area offers a representative cross section of the rockier areas within the Kazan Upland, including a modest variety of wetlands.

The Colin Lake area offers extensive sand plain vegetation which is not found at Wylie Lake; however, no new species are added with this type. The Colin Lake area does offer several interesting habitats: grassy slopes, unique wetlands and lake communities, and rocky islands.

The Woodman Lake area offers extensive sand dune vegetation which is not found at Wylie Lake, but no significant species are added by this. Woodman Lake also offers extensive and varied wetlands, including unique types, which add several significant species.

8. WILDLIFE ANALYSIS

Out of a total of 78 species of birds which have been recorded for the study area, 49 were recorded in the Wylie Lake area, 63 around Colin Lake and 51 in the vicinity of Woodman Lake.

The 29 species not found in the Wylie Lake area are:

Horned Grebe
Canada Goose
Gadwall
American Wigeon
Ring-necked Duck
Greater Scaup
Lesser Scaup
Hooded Merganser
Sharp-shinned Hawk
American Kestrel
Semipalmated Plover
Lesser Yellowlegs
Solitary Sandpiper
Least Sandpiper
Ring-billed Gull
California Gull
Arctic Tern
Bohemian Waxwing
Cedar Waxwing
Solitary Vireo
Northern Waterthrush
Wilson's Warbler
Western Tanager
Clay-colored Sparrow
Savannah Sparrow
LeConte's Sparrow
White-throated Sparrow
Red-winged Blackbird

Of these 29 species, 15 are associated with special habitats not occurring in the Wylie Lake area:

-- Kettle ponds

Horned Grebe
Canada Goose
Ring-necked Duck
Greater Scaup
Semipalmated Plover
Lesser Yellowlegs
Solitary Sandpiper

-- Eutrophic lakes

American Wigeon
Ring-necked Duck
Greater Scaup
Lesser Scaup
Lesser Yellowlegs
Solitary Sandpiper
Least Sandpiper

-- Extensive open wetlands

Savannah Sparrow
LeConte's Sparrow

-- Extensive shrubbery

Cedar Waxwing
Wilson's Warbler

With the exception of subarctic species, none of the above is considered significant from a provincial perspective although some species represent extensions to previously known ranges. Of the 28 species not recorded at Wylie Lake, four are considered subarctic:

Greater Scaup
Semipalmated Plover
Least Sandpiper
Arctic Tern

The two subarctic species found nesting during the study period, Mew Gull and Semipalmated Plover, nest only at Colin Lake.

The populations of songbirds in the Colin Lake and Woodman Lake areas are generally higher and the species diversity is greater than at Wylie Lake. This is probably related to the greater vegetation diversity around Colin Lake and Woodman Lake.

The Common Loon, Bald Eagle and Herring Gull occur in higher numbers in the Colin Lake area.

Most mammals, including Fisher and River Otter, appear to be more abundant in the Colin Lake and Woodman Lake areas than in the Wylie Lake area. The Wolverine and Wolf, which occur at Woodman Lake and Colin Lake, have not been reported from Wylie Lake during recent years.

A total of four wildlife species have been recorded only for Wylie Lake: the Hawk Owl and Yellow-bellied Sapsucker, in old birch woods, and the Coyote and Leopard Frog.

It is apparent from the preceding analysis that a significant number of bird species do not occur at Wylie Lake which do occur in other parts of the Kazan Upland. Most of these do occur within the floristically significant habitats at Woodman Lake and Colin Lake.

9. LITERATURE CITED

The following is a list of all publications cited in the report.

Banfield, A. 1974. The Mammals of Canada. University of Toronto, Toronto.

Bishoff, K. and R. Fyfe. 1975. Surveys of rare, potentially endangered and sensitive birds in the oil sands and adjacent areas of northwestern Alberta. Unpublished Canadian Wildlife Service report for Alberta Oil Sands Environmental Research Program, Edmonton.

Boivin, B. 1983. Flora of the Prairie Provinces, Parts I-V. Herbier Louis Marie, Universite Laval, Quebec.

Boyd, M. 1977. Analysis of fur production records by individual fur-bearing species for registered trapping areas in Alberta, 1970-75. Alberta Recreation, Parks and Wildlife, Research and Systems Section, Edmonton.

Bradley, C. 1978. Precambrian Shield study. Part I: Information survey and bibliography. Alberta Parks Division, Resource Assessment and Management Section, Edmonton.

Godfrey, J. and C. Langenberg. 1978. Metamorphism in the Precambrian Shield of northeastern Alberta. Geology Division, Alberta Research Council, Edmonton. Contribution Series No. 807.

Harper, F. 1932. Mammals of the Athabaska and Great Slave Lake region. Journal of Mammalogy 13: 19-36.

Hohn, E. 1971. The birds of the Lake Athabasca area, Mackenzie District, N.W.T., Alberta and Saskatchewan. Canadian Wildlife Service, Edmonton.

Hohn, E. 1973. The birds of the Peace-Athabasca delta and of the Lake Athabasca region. Canadian Wildlife Service, Edmonton.

Johnston-Beaver, L. 1979. Biology and management of Peregrine Falcons (Falco peregrinus anatum) in northeastern Alberta. Unpublished Canadian Wildlife Service report for Alberta Oil Sands Environmental Research Program, Edmonton.

Moss, E. 1983. Flora of Alberta. Second edition revised by J. Packer. University of Toronto Press, Toronto.

Nero, R. 1963. Birds of the Lake Athabasca region, Saskatchewan. Saskatchewan Natural History Society, Special Publication No. 5.

Nero, R. 1967. Additional bird notes for Little Gull Lake, Saskatchewan. Blue Jay 25: 11-14.

Raup, H. 1928. A survey of the vegetation of Shelter Point, Athabasca Lake. Ph.D. Thesis, University of Pittsburgh, Pennsylvania.

Raup, H. 1936. Phytogeographic studies in the Athabasca-Great Slave Lake Region I. Catalogue of the Vascular Plants. Journal of the Arnold Arboretum 17: 180-315.

Raup, H. 1946. Phytogeographic studies in the Athabasca-Great Slave Lake Region II. Journal of the Arnold Arboretum 27: 1-85.

Rhude, L. 1977. Characteristics of some Canadian Shield lakes in Alberta. Alberta Recreation, Parks and Wildlife, Fish and Wildlife Division, Edmonton.

Rowe, J. 1972. Forest regions of Canada. Canada Department of Northern Affairs and Natural Resources, Forestry Branch, Ottawa. Bulletin 123.

Salt, W. and J. Salt. 1976. The Birds of Alberta, with their ranges in Saskatchewan and Manitoba. Hurtig, Edmonton.

Scoggan, H. 1979. The Flora of Canada. National Museum of Natural Sciences, Ottawa.

Scotter, G. 1970. Wildfires in relation to the habitat of Barren-Ground Caribou in the taiga of northern Canada. Proceedings of the Annual Tall Timbers, Fire and Ecology Conference No. 10: 85-106.

Soper, D. 1964. The Mammals of Alberta. Hamly, Edmonton.

Thomas, D. 1969. Population estimate and distribution of Barren Ground Caribou in Mackenzie District, N.W.T., Saskatchewan and Alberta. Canadian Wildlife Service, Ottawa. Report Series No. 9.

Wuetherick, R. 1971. A summary report of the history of Fort Chipewyan. Peace-Athabasca Delta Project, Canadian Wildlife Service, Edmonton.

10. BIBLIOGRAPHY

The following is a list of publications not cited in the report which may be of use to researchers doing further studies in the Kazan Upland.

Abouguendia, Z. and R. Godwin. 1982. Botanical investigations along the Pinehouse-Key Lake Road, North-central Saskatchewan. Musk-Ox 31: 17-49.

Bayrock, L. 1972. Surficial geology of the Fort Chipewyan area, Alberta. Alberta Research Council, Edmonton. Surficial Geology Maps.

Bird, J. 1972. The Natural Landscapes of Canada. Wiley, Toronto.

Bostock, H. 1970. Physiographic regions of Canada, west of Manitoba. Geological Survey of Canada, Ottawa. Map 1254A.

Clayton, J., W. Ehrlich, D. Cann, J. Day, and I. Marshall. 1977. Soils of Canada. Canada Department of Agriculture, Research Branch, Ottawa.

Francis, J. and K. Lumbis. 1979. Habitat relationships and management of terrestrial birds in northeastern Alberta. Unpublished Canadian Wildlife Service report prepared for Alberta Oil Sands Environmental Research Program, Edmonton.

Godfrey, J.D. 1958. Aerial photographic interpretation of Precambrian structures north of Lake Athabasca, Alberta. Alberta Research Council, Edmonton. Bulletin #1.

Godfrey, J. 1959. Precambrian Shield structures north of Lake Athabasca, Alberta. Canadian Mining Journal, Jan.: 1-4.

Godfrey, J. 1961. Geology of the Andrew Lake, north district, Alberta. Alberta Research Council, Edmonton. Earth Sciences Report 58-3.

Godfrey, J. 1963. Geology of the Andrew Lake, south district, Alberta. Alberta Research Council, Edmonton. Earth Sciences Report 61-2.

Godfrey, J. 1966. Geology of the Bayonet, Ashton, Potts and Charles Lake districts, Alberta. Alberta Research Council, Edmonton. Earth Sciences Report 65-6.

Godfrey, J. 1976. Selected features related to the late glacial history on the Shield of northeastern Alberta. GAC-MAC Program w/Abstracts Vol. 1.

Godfrey, J. 1979. Geology of the Alexander-Wylie Lakes district, Alberta. Alberta Research Council, Edmonton. Earth Sciences Report 78-1.

Godfrey, J. 1980. Geology of the Fort Chipewyan district, Alberta. Alberta Research Council, Edmonton. Report 78-3.

Godfrey, J. and H. Baadsgaard. 1962. Structural pattern of the Precambrian Shield in northeastern Alberta and mica age-dates from the Andrew Lake district. The Royal Society of Canada Special Publications No. 4, "The Tectonics of the Canadian Shield".

Godfrey, J. and E. Peikert. 1963. Geology of the St. Agnes Lake district, Alberta. Alberta Research Council, Edmonton. Earth Sciences Report 62-1.

Godfrey, J. and E. Peikert. 1964. Geology of the Colin Lake district, Alberta. Alberta Research Council, Edmonton. Earth Sciences Report 62-2.

Harper, F. 1931. Physiographic and faunal areas in the Athabaska and Great Slave Lake region. Ecology 12: 18-32.

Harper, F. 1931. Amphibians and reptiles of the Athabaska and Great Slave Lake region. Canadian Field-Naturalist 45: 68-70.

Johnson, E. 1981. Vegetation organization and dynamics of lichen woodland communities in the Northwest Territories. Ecology 62: 200-215.

Kuyt, E. 1982. Semipalmated Plover breeding in Alberta. Alberta Naturalist 12: 6-9.

Lindsay, J. S. Pawluk and W. Odynsky. 1963. Exploratory soil survey of Alberta map sheets NTS 74M, 74L, 74E, and 73L (north half). Alberta Research Council, Edmonton. Soil Survey Exploratory Report 63-1

Logier, E. and G. Toner. 1961. Checklist of the amphibians and reptiles of Canada and Alaska. Royal Ontario Museum, Life Sciences Division, Toronto. Contribution No. 53.

MacIver, D. 1981. The biogeoclimates of central and northern Alberta. Alberta Forest Service. Alberta Energy and Natural Resources, Edmonton.

McNicholl, M. 1982. Alberta bird species at risk. Alberta Naturalist 12: 55-79.

Moss, E. 1955. The vegetation of Alberta. Botanical Review 21: 493-567.

Nelson, J. and M. Paetz. 1982. Alberta fish species. Alberta Naturalist 12: 52-53.

Paetz, M. and S. Nelson. 1970. The Fishes of Alberta. Queen's Printer, Edmonton.

Raup, H. 1930. The distribution and affinities of the vegetation of the Athabasca-Great Slave Lake Region. Rhodora 32: 187-208.

Raup, L. 1930. The lichen flora of the Shelter Point Region, Athabasca Lake. The Bryologist 33: 57-66.

Roberts, W. 1982. Threatened or endangered native species of amphibians and reptiles of Alberta. Alberta Naturalist 12: 54.

Soper, J. 1942. Mammals of Wood Buffalo Park, northern Alberta nd District of Mackenzie. Journal of Mammalogy 23: 119-145.

Soper, J. 1942. The birds of Wood Buffalo Park and vicinity, northern Alberta and District of Mackenzie, N.W.T., Canada. Transactions of the Royal Canadian Institute 24: 19-97.

Watanabee, R. 1961. The Waugh Lake metasedimentary complex, northeastern Alberta; unpublished M.Sc. thesis, University of Alberta, Edmonton.

Weseloh, D. and L. Cocks. 1979. Recent nesting of the Caspian Tern at Egg Island, Lake Athabasca, Alberta. Blue Jay 37: 212-215.

APPENDIX A: ANNOTATED LISTS OF FLORA

Vascular Plants

The following is a list of all vascular plants reported for the Canadian Shield north of Lake Athabasca. It does not include collections made along the Slave River lowland portion of the Canadian Shield natural region. All collections from the north shore of Lake Athabasca are included (practically the only collection records for the area north of Lake Athabasca), even though some of these are not recorded in the Kazan Upland proper. Taxonomy follows Moss (1983) for species previously recorded in Alberta and Scoggan (1979) for new records.

Lycopodium annotinum L. Common in dry woods and open bogs.
Lycopodium clavatum L. Found on dry rocky ridges at Shelter Point and Sand Point, apparently rare in northeastern Alberta.
Lycopodium complanatum L. Common in dry woods.
Lycopodium obscurum L. Rare in sandy pine woodlands.
Lycopodium selago L. Found at Sand Point. Split distribution, northeastern Alberta and foothills/mountain region.
Selaginella rupestris (L.) Spring Only five localities previously reported for Alberta. Largely confined to the Canadian Shield. Apparently common on sandy and rocky hillsides around Lake Athabasca. Northwards, confined to grasslands on steep south-facing hillsides around Colin Lake; only rarely found in rocky and sandy pine woods.
Selaginella selaginoides (L.) Link Rare in northeastern Alberta. Found in wet mossy crevices near Sand Point.
Isoetes echinospora Dur. Only three collections in Alberta; one in shallow water on sandy-gravelly shore of a small lake near Sand Point.
Equisetum arvense L. Local, in moist woodlands and meadows.
Equisetum fluviatile L. Common at edges of lakes and ponds; occasionally in black spruce bogs.
Equisetum hyemale L. Collections west of Colin Lake on south-facing slopes on gravelly till constitute the first records of this species in the Canadian Shield in Alberta.
Equisetum pratense Ehrh. Scarce, on dry or moist, open sandy or gravelly sites; first records for Canadian Shield in Alberta.
Equisetum scirpoides Mx. Local in wetter sites under dense black spruce or in seepage areas.
Equisetum sylvaticum L. Fairly common in shady spruce woods.

Botrychium lunaria (L.) Sw. Found only in meadow by unique wetland north of Colin Lake, CL62; first record for Canadian Shield in Alberta; apparently scarce in northeastern Alberta.

Botrychium multifidum (Gmel.) Rupr. Only seven localities previously reported for Alberta. Found at Sand Point, where abundant in sandy thickets and open woods. Also found in meadow by unique wetland north of Colin Lake, CL62.

Cryptogramma acrostichoides R.Br. Split distribution, Rocky Mountains and Canadian Shield. Fairly common in dry rock crevices.

Cystopteris fragilis (L.) Bernh. Scarce, at Chipewyan and granite hill in Peace-Athabasca delta.

Dryopteris fragrans (L.) Schott Split distribution, Rocky Mountains and Canadian Shield. Only five localities previously reported for Alberta. Fairly common in rock crevices, usually in exposed, drier locations on south-facing slopes.

Gymnocarpium dryopteris (L.) Newm. Scarce, in rich woods.

Gymnocarpium jessoense (Koidz.) Koidz. Only two collections previously reported for Alberta: cliffs at Shelter Point and near Sand Point. Rare; found only on shaded north-facing cliff faces close to water's edge. Confined to the Canadian Shield.

Polypodium virginianum L. Only five localities previously reported for Alberta. Confined to the Canadian Shield. Occasional in exposed bedrock crevices, principally on steeper north-facing open sites.

Woodsia ilvensis (L.) R.Br. Only three localities previously reported for Alberta. Confined to the Canadian Shield. Occasional in rock crevices.

Woodsia oregana D.C. Eat. Found on granite hill in Peace-Athabasca delta. Widely disjunct, in Alberta known principally from the Rocky Mountains.

Juniperus communis L. Common on dry rocky ridges and sand plains in jack pine.

Juniperus horizontalis Moench Rare, found only on steep south-facing slopes in the vicinity of Colin Lake and Woodman Lake. Apparently more common along the north shore of Lake Athabasca.

Larix laricina (Du Roi) K.Koch Occasional in bogs and swamps.

Picea glauca (Moench) Voss Scarce north of Lake Athabasca except right on the shoreline of Lake Athabasca where it forms the predominant vegetation. Elsewhere it is restricted to small stands along sandy shores of lakes.

Picea mariana (Mill.) BSP. Dominant tree of bogs, also found on upland sites.

Pinus banksiana Lamb. Dominant tree of rock outcrops and sand plains.

Typha latifolia L. Dominant in a few sheltered bays; first records for Kazan Upland in Alberta. No collections made; photographs taken.

Sparganium angustifolium Mx. Found only on shore of beaver pond seepage area south of Woodman Lake, WM 84; first record for Canadian Shield in Alberta.

Sparganium fluctuans (Morong.) Robins. Only one record known for Alberta; small pond at Shelter Point.

Sparganium minimum (Hartm.) Fries Occasional in wet pools in bogs and swamps.

Potamogeton alpinus Balbis Dominant aquatic species in shallow bays and along creeks; first records in Kazan Upland of Alberta.

Potamogeton filiformis Pers. Found near Sand Point.
Potamogeton gramineus L. Found in ponds at Shelter Point and Sand Point. Uncommon in pools in bogs and swamps.
Potamogeton natans L. Noted only in deep water of quiet bay of the southeast arm of Colin Lake, forming stands; first record for northern Alberta; only eight previous records for Alberta, all in the foothill/mountain regions or in central Alberta.
Potamogeton praelongus Wulf. Occasional in deep water of lakes; first records in the Canadian Shield in Alberta; uncommon in Alberta.
Potamogeton pusillus L. Occasional in shallow water of lakes, most common in Woodman Lake area where there is a heavy organic accumulation; first records in the Canadian Shield in Alberta.
Potamogeton richardsonii (Benn.) Rydb. Occasional in stream channels and shallow water in lakes.
Potamogeton robbinsii Oakes Noted only in deep water of quiet bay of the southeast arm of Colin Lake, where rare; first record for Kazan Upland of Alberta; second record for Alberta; apparently rare in western Canada.
Triglochin maritima L. Rare, found only at WL7, sedge edge of stream channel and at WL38, moose wallow at edge of Wylie Lake; first records for the Canadian Shield of Alberta.
Triglochin palustris L. Rare, found only at WM84, shore of beaver pond south of Woodman Lake; first record for the Canadian Shield of Alberta.
Sagittaria cuneata Sheld. Scarce in shallow water marshes. No collections made. First records for Kazan Upland in Alberta.
Agropyron trachycaulum (Linke) Malte var. trachycaulum Fairly common in drier woodlands. Also found along sandy beaches and in grasslands on south-facing gravelly till in the vicinity of Colin Lake. Var. unilaterale (Cass.) Malte occurs only at the base of grassy slopes in the Colin Lake area.
Agrostis scabra Willd. Fairly common in damp crevices in rocks and on sandy shores.
Bromus inermis Leyss. ssp. pumpellianus (Scribn.) Wagnon Common on the sandy north shore of Lake Athabasca at Shelter Point and Sand Point.
Calamagrostis canadensis (Mx.) Beauv. Common in wet woods, bogs, swamps, stream and lake margins; also in burned jack pine woods.
Calamagrostis purpurascens R.Br. Apparently rare in northern Alberta away from the main range in the Rocky Mountains; split distribution. Fairly common in open woodlands on sandy, gravelly soil and in grasslands on south-facing slopes in the vicinity of Colin Lake.
Danthonia spicata (L.) Beauv. Only three records known for Alberta. Found on rocky hills northwest of Sand Point.
Deschampsia cespitosa (L.) Beauv. On sandy shores and pond edges along north shore of Lake Athabasca.
Elymus innovatus Beal Rare in dry open woodlands; first records for the Kazan Upland in Alberta.
Elymus mollis Trin. Only one locality known for Alberta. Confined to the Canadian Shield. Common on the sandy north shore of Lake Athabasca at Shelter Point.
Festuca rubra L. Common on the sandy north shore of Lake Athabasa at Shelter Point and Sand Point.

Festuca saximontana Rydb. Common on dry rocky ridges and in open sandy or rocky woodland.

Glyceria borealis (Nash) Batch. Uncommon around wet pools in bogs and swamps; also at unique wetland CL51 north of Colin Lake.

Glyceria pulchella (Nash) K. Schum. Found at Shelter Point.

Glyceria striata (Lam.) A.S. Hitchc. Scarce, in wetter swamps and bogs; first records for Canadian Shield in Alberta; apparently scarce in northeastern Alberta.

Hierochloe odorata (L.) Beauv. Found at Sand Point. Rare, on sandy shores.

Hordeum jubatum L. Found at Shelter Point.

Oryzopsis pungens (Torr.) A.S. Hitchc. Common in sandy jack pine woods.

Phragmites australis (Cav.) Trin. ex Steud. Rare in the Kazan Upland. Found in a quiet bay along the north shore of Wylie Lake. Also known from Sand Point.

Poa canbyi (Scribn.) Piper Rare, found only in grasslands on gravelly south-facing slopes in the vicinity of Colin Lake; first records for northeastern Alberta; widely disjunct from principal range in southern and western Alberta.

Poa glauca Vahl Fairly common on dry rocky ridges and in open sandy or rocky woodland. Also found in burns.

Poa interior Rydb. Found only in grasslands in the vicinity of Colin Lake and Woodman Lake; first records for Canadian Shield in Alberta.

Poa palustris L. Found at Shelter Point.

Poa pratensis L. Common in damp meadows and along lakeshore and stream edges; occasionally in bogs. Both ssp. alpigena (Fr.) Lindm. and ssp. agassizensis Boivin & D. Love occur, the former more commonly.

Stipa curtiseta (A.S. Hitchc.) Bark. Local, found only in grasslands on gravelly south-facing slopes in the vicinity of Colin Lake and Woodman Lake; first records for Canadian Shield in Alberta.

Trisetum spicatum (L.) Richt. Found on the sandy north shore of Lake Athabasca at Shelter Point.

Carex sp. A distinctive sedge was found in a unique wetland seepage area south of Woodman Lake, WM84. It was common and sufficient material was collected. To date, no taxonomist has been able to place it. It is either a hybrid for which the parents are not obvious or it is a new species. Other experts are now examining the material. A sedge collected at CL60, the unique wetland north of Colin Lake, has been tentatively referred as Carex bigelowii Torr., a variable species for which there are a few tentative records for the mountains in Alberta.

Carex aenea Fern. Scarce in dry sandy woodlands; more common in recent burns.

Carex aquatilis Wahl. Dominant sedge of marshy lakeshores and swamps; also found in black spruce bogs.

Carex aurea Nutt. Scarce, on muddy or sandy shores. The form of this species previously referred to as Carex garberi occurs in the unique wetland north of Colin Lake, CL60.

Carex brunnescens (Pers.) Poir. Found near Sand Point.

Carex buxbaumii Wahl. Noted only at WL7, stream channel between two lakes at Wylie Lake; first record for Canadian Shield in Alberta. Split distribution, northeastern Alberta and Rocky Mountains.

Carex capillaris L. Found at Sand Point and in seepage area on shore of beaver pond south of Woodman Lake, WM84. Apparently rare in northeastern Alberta.

Carex chordorrhiza L.f. Apparently scarce, found in sheltered bay along shoreline of Wylie Lake, WL19 and CL65, wetland northwest of Colin Lake; first records for Canadian Shield in Alberta.

Carex crawfordii Fern. Common on the sandy north shore of Lake Athabasca at Shelter Point, otherwise rare in the Kazan Upland. Known from unique wetland CL51 north of Colin Lake.

Carex curta Good. Fairly common in bogs; found once on shoreline.

Carex deflexa Horn. Uncommon, found only in recent burns at Wylie Lake; first records for northern Alberta; eighth record for Alberta.

Carex diandra Schrank Locally common in swamps and along stream and lakeshore edges.

Carex disperma Dewey Scarce in swamps.

Carex gynocrates Wormsk. Found at Shelter Point.

Carex heleonastes Ehrh. Rare, first records for northern Alberta; in bog, Wylie Lake, WL1. Widely disjunct; occurs principally in central Alberta and Rocky Mountains.

Carex interior Bailey Found only in unique wetland seepage area south of Woodman Lake, WM84; first record for Canadian Shield in Alberta; apparently rare in northern Alberta.

Carex lasiocarpa Ehrh. Noted only in wetland north of lake west of Colin Lake, CL65; first record in Kazan Upland of Alberta.

Carex lenticularis Mx. Only two localities previously reported for Alberta. Confined to the Canadian Shield. Found on the north shore of Lake Athabasca at Shelter Point. Scarce on damp sandy beaches and in shallow water.

Carex leptalea Wahl. Found at Sand Point.

Carex limosa L. Fairly common in wetter bogs and swamps.

Carex cf. loliacea L. Only one record in birch-alder swamp at Wylie Lake, N7; first record for Canadian Shield in Alberta; fourth record for Alberta.

Carex norvegica Retz. Found in Picea-Ledum-Sphagnum muskeg at Shelter Point. Occasional in open, wetter parts of bogs; found once in birch-alder swamp.

Carex paupercula Mx. Fairly common in bogs and swamps.

Carex rostrata Stokes Dominant sedge in numerous marshes and swamps.

Carex saxatilis L. Rare, previously known only from Shelter Point in northeastern Alberta (not referenced in Flora of Canada or in latest Flora of Alberta), otherwise confined to the mountains. Also found at unique wetland north of Colin Lake CL51. This split distribution apparently reflects two different subspecies or species, depending on taxonomy.

Carex siccata Dewey Fairly common in dry sandy jack pine woods and open beach ridges. Also prominent in grasslands and meadows in the vicinity of Colin Lake.

Carex supina Wahl. ssp. spaniocarpa (Steud.) Hult. Local, found only in grasslands on steep south-facing gravelly hillsides in the vicinity of Colin Lake and Woodman Lake; first records for Alberta. Known in adjacent northwestern Saskatchewan, where rare.

Carex tenuiflora Wahl. Common in bogs; first records for Canadian Shield in Alberta.

Carex umbellata Schk. Occasional in sandy sites, both in open burns and exposed sand along shores; possibly the first records for northern Alberta, although there is an old Richardson collection (var. tonsa Fern.) labelled Chipewyan, not referenced in latest Flora of Alberta but is referenced in Flora of Canada. Var. tonsa is most frequent. Var. umbellata is only known from the unique wetland north of Colin Lake; this variety has not been described for northern Alberta. Sometimes considered two species.

Carex vaginata Tausch Only one record from birch-alder swamp at Wylie Lake; first record for Canadian Shield in Alberta.

Carex viridula Mx. Apparently rare in the Boreal Forest and Canadian Shield natural regions; only one previously reported locality on the north shore of Lake Athabasca, near Sand Point. Infrequent on wet sand, mostly along lake shores. Other Alberta localities are much further south.

Eleocharis acicularis (L.) R. & S. Found in pools at Shelter Point and at Sand Point. Also found at unique wetland north of Colin Lake CL51.

Eleocharis palustris (L.) R. & S. Found in ponds at Shelter Point, scarce elsewhere in shallow water marshes along ponds and lakeshores.

Eleocharis quinqueflora (F.X. Hartm.) O. Schwarz Found only in unique wetland seepage area south of Woodman Lake, WM84; first record for northern Alberta; widely disjunct from its main range in southern and central Alberta.

Eriophorum brachyantherum Trautv. Occasional in wetter parts of bogs, found once in shallow water of Wylie Lake; first records for Canadian Shield in Alberta.

Eriophorum chamissonis C. A. Mey. Found in Picea-Ledum-Sphagnum muskeg at Shelter Point. Occasional in wetter pools in bogs. Var. albidum (Nyl.) Fern. collected at Shelter Point; other varieties more common here.

Eriophorum gracile Koch Uncommon in wetter swamps, bogs and marshes; first records for Canadian Shield in Alberta.

Eriophorum polystachion L. Scarce in wetter bogs and swamps.

Eriophorum viridi-carinatum (Engelm.) Fern. Apparently rare in northeastern Alberta; found at Shelter Point.

Scirpus acutus Muhl. ex Bigel. Locally dominant in sheltered bays and shallow lakes; first records for Canadian Shield in Alberta.

Scirpus cespitosus L. Only one locality known on the north shore of Lake Athabasca, near Sand Point. Other Alberta localities are much further south.

Scirpus cyperinus (L.) Kunth. Only six localities reported for Alberta; two on the north shore of Lake Athabasca; rocky pond at Shelter Point, also at Sand Point.

Scirpus hudsonianus (Mx.) Fern. Apparently rare in northern Alberta; other Alberta localities are much further south. Found near Sand Point and in unique wetland seepage area south of Woodman Lake, WM84.

Scirpus microcarpus Presl. Noted only along stream channel at west end of Colin Lake; first record for Canadian Shield in Alberta.

Calla palustris L. Frequent along creek margins.

Juncus alpinoarticulatus Chaix Occasional on damp sand, mostly along lake shores.

Juncus balticus Willd. Found on the sandy north shore of Lake Athabasca at Shelter Point and Sand Point.

Juncus brevicaudatus (Engelm.) Fern. Apparently common at Shelter Point and Sand Point on wet sandy shores of ponds and beach lagoons. Scarce elsewhere on damp sandy shores. Only four collections reported in Alberta.

Juncus bufonius L. Found on the sandy north shore of Lake Athabasca at Shelter Point.

Juncus filiformis L. Found on the sandy north shore of Lake Athabasca at Shelter Point and Sand Point. Only five previously reported localities in Alberta. Also at unique wetland north of Colin Lake, CL60.

Juncus nodosus L. Found at Shelter Point.

Juncus vaseyi Engelm. Occasional on wet sand, mostly along lakeshores.

Allium schoenophrasum L. Found on rocky ridge at Shelter Point. Apparently rare in northern Alberta away from its main range in the Foothills and Rocky Mountains; split distribution.

Maianthemum canadense Desf. Occasional in open sandy jack pine woodlands.

Smilacina trifolia (L.) Desf. Fairly common in wetter portions of black spruce bogs.

Tofieldia pusilla (Mx.) Pers. Apparently rare in northern Alberta; only one record on the north shore of Lake Athabasca, near Sand Point. Main distribution is in the Foothills and Rocky Mountain natural regions.

Sisyrinchium montanum Greene Found at Shelter Point and Sand Point.

Corallorhiza trifida Chat. Scarce, in shaded areas in black spruce bogs.

Cypripedium acaule Ait. Only three localities reported for Alberta; one on the north shore of Lake Athabasca near Sand Point. Confined to the Canadian Shield.

Goodyera repens (L.) R.Br. Apparently locally common on sandy beach ridges at Shelter Point and Sand Point.

Habenaria hyperborea (L.) R.Br. Found at Shelter Point and in unique wetland seepage area south of Woodman Lake, WM84.

Habenaria obtusata (Pursh) Richards. Found at Shelter Point.

Spiranthes romanzoffiana C. & S. Found in Picea-Ledum-Sphagnum muskeg at Shelter Point, also at Sand Point. Also in moose wallow WL38 at Wylie Lake and WM84, shore of beaver pond south of Woodman Lake.

Populus balsamifera L. Occasional on lower moist sites.

Populus tremuloides Mx. Locally dominant on uplands on sandy and rocky sites.

Salix arbusculoides Anderss. Found on damp sandy shores at Sand Point and unique wetland seepage area south of Woodman Lake.

Salix arctica Pallas Found at Fort Chipewyan. Not referenced in revised Flora of Alberta or Boivin's Flora of the Prairie Provinces but is confirmed in Flora of Canada.

Salix bebbiana Sarg. Occasional on sandy lake shores.

Salix cf. brachycarpa Nutt. var. antimima (Schneid.) Raup Found only in meadow by unique wetland north of Colin Lake, CL62. Only one other record in northern Alberta; first record for Canadian Shield in Alberta.

Salix glauca L. Fairly common in bogs and along streams.

Salix lucida Muhl. Found at Shelter Point and Sand Point.

Salix myrtillifolia Anderss. Fairly common in bogs.

Salix pedicellaris Pursh Fairly common in wetter swamps and bogs.

Salix planifolia Pursh Dominant willow in willow thickets, also found in swamps and bogs and at stream and lake edges.

Salix pyrifolia Anderss. Fairly common on sandy lakeshores and beach ridges; also in recent burns.

Salix scouleriana Barr. ex Hook. Found at Shelter Point and Sand Point.

Myrica gale L. Common along rocky and sandy lakeshores and stream banks.

Alnus crispa (Ait.) Pursh Dominant understory species in sandy jack pine woods and open rocky woodland; occasional in black spruce bogs.

Alnus tenuifolia Nutt. Frequent on moist sites along lake shores and streams.

Betula glandulosa Mx. Common species in wetter bogs, swamps and fens.

Betula neoalaskana Sarg. Frequent throughout on upland sites, occasionally dominant. Also found in bogs.

Betula pumila L. Dominant species in some stream edge swamps; also found along lake shores; first records for Canadian Shield in Alberta.

Urtica dioica L. ssp. gracilis (Ait.) Selander Noted only along stream channel at west end of Colin Lake; first record for Canadian Shield in Alberta.

Geocaulon lividum (Richards.) Fern. Fairly common in dry woodlands.

Arceuthobium americanum Nutt. On jack pine, Shelter Point and Sand Point, scarce.

Polygonum amphibium L. Found in ponds at Shelter Point and in shallow water marshes, and in unique wetland north of Colin Lake, CL60.

Polygonum douglasii Greene Found in small patches of soil among granite hills at Fort Chipewyan and CL77, portage along the Colin River in sandy pine woods.

Polygonum lapathifolium L. Primary species on sandy beaches on the north shore of Lake Athabasca at Shelter Point.

Rumex britannica L. Noted only along streams in vicinity of Woodman Lake; first records for northern Alberta.

Rumex maritimus L. Found on the sandy north shore of Lake Athabasca at Shelter Point.

Rumex occidentalis S. Wats. Found at Shelter Point and in swamp, WL8 at Wylie Lake; rare.

Rumex triangulivalvis (Dans.) Rech. f. Found on the sandy north shore of Lake Athabasca at Shelter Point and Sand Point.

Chenopodium album L. Very locally abundant weed; island at Woodman Lake, Shelter Point.

Chenopodium leptophyllum (Nutt. ex Moq.) S. Wats. Small prairie on granite hill, east shore of Lake Mamawi. This was the only locality previously described for this species in Alberta. Noted on grassy slope CL70 near kettle lakes west of Colin Lake.

Cerastium beeringianum C. & S. Only one record, Sand Point, where common in damp rock crevices. Otherwise known in Alberta only from the Rocky Mountains. Not shown in revised Flora of Alberta, but is confirmed in Flora of Canada and Flora of the Prairie Provinces.

Minuartia dawsonensis (Britt.) House Found at Shelter Point. Rare in northeastern Alberta.

Minuartia rubella (Wahl.) Graebn. Found at Fort Chipewyan. Otherwise known in Alberta only from the Rocky Mountains. Not shown in revised Flora of Alberta, but is confirmed in Flora of Canada.

Sagina nodosa (L.) Fenzl. Only two previously reported localities for Alberta: pond at Shelter Point and at Sand Point. Also found at unique wetland north of Colin Lake, CL60. Confined to the Canadian Shield.

Silene antirrhina L. Only one previously reported locality for Alberta, turfy hillsides at Fort Chipewyan. Found on grassy hillsides west of Colin Lake. Confined to the Canadian Shield.

Stellaria calycantha (Ledeb.) Bong. Found at Shelter Point and Sand Point.

Stellaria longifolia Muhl. Uncommon in wetter bogs, marshes and wet sands; first records for Kazan Upland in Alberta.

Stellaria longipes Goldie Occasional in a variety of drier habitats.

Nuphar variegatum Engelm. Dominant in shallow water of lakes.

Anemone multifida Poir. Occasional in dry open woodlands on sandy soil; first records for Canadian Shield in Alberta.

Anemone patens L. Scarce in open sandy woodlands and grassy slopes.

Aquilegia brevistyla Hook. Found at Sand Point.

Ranunculus cardiophyllus Hook. Disjunct at Fort Chipewyan from its main range further west and south. Not confirmed in revised Flora of Alberta but is shown in Flora of Canada.

Ranunculus circinatus Sibth. Fairly common in wet pools in bogs and swamps and in shallow water in lakes; first records for Canadian Shield in Alberta.

Ranunculus gmelinii DC. Occasional in ponds and pools in bogs and swamps and along muddy lake shores.

Ranunculus lapponicus L. Occasional in wetter bogs and swamps.

Ranunculus pedatifidus J.E. Smith Found at Fort Chipewyan, otherwise known only from southern Alberta.

Ranunculus pensylvanicus L.f. Found at Shelter Point.

Ranunculus reptans L. Occasional on damp sandy lake shores.

Corydalis aurea Willd. Found at Fort Chipewyan and Shelter Point.

Corydalis sempervirens (L.) Pers. Frequent in open rocky areas.

Arabis hirsuta (L.) Scop. Found only in meadow by unique wetland north of Colin Lake, CL62; first record of this species in Canadian Shield in Alberta.

Arabis holboellii Hornem. var. retrofracta (Grah.) Rydb. Scarce, found at Shelter Point and in grasslands on gravelly south-facing slopes in the vicinity of Colin Lake.

Arabis lyrata L. ssp. kamchatica (Fisch.) Hult. Occasional in dry woodlands, on sandy shores and grassy slopes.

Barbarea orthoceras Ledeb. Only five collections noted for Alberta, one on sandy north shore of Lake Athabasca near Sand Point.

Cardamine pensylvanica Muhl. Found on the north shore of Lake Athabasca at Shelter Point.

Cardamine pratensis L. Noted only on gull nesting island in Colin Lake in shallow water with Equisetum fluviatile in quiet bay, CL 73; first record for northern Alberta; fifth Alberta record.

Draba nemorosa L. Found only in dry grasslands on south-facing slopes in the vicinity of Colin Lake; first records for Canadian Shield in Alberta.

Rorippa palustris (L.) Bess. Occasional on damp sandy lake shores and in marshes.

Drosera anglica Huds. Found at Shelter Point and Sand Point. Rare in northern Alberta, the Lake Athabasca collections quite disjunct from the main range further south; uncommon in Alberta.

Drosera rotundifolia L. Frequent in wetter portions of bogs and swamps.

Heuchera richardsonii R.Br. Found on dry rocky ridges at Shelter Point and near Sand Point; also at edge of pine woods along stream channel between Woodman Lake and Colin Lake. Apparently disjunct in this region from grassland and parkland areas to the south and west.

Mitella nuda L. Scarce in shady woodlands.

Saxifraga tricuspidata Rottb. Split distribution in Alberta; Rocky Mountains and Canadian Shield. Common on rocky sites and on grassy slopes.

Parnassia palustris L. Frequent on sandy shores. Ssp. montanensis Fern. & Rydb. is most prevalent.

Ribes glandulosum Grauer Found on dry rocky ridges at Shelter Point. Rare, in open woods and along sandy shores.

Ribes hudsonianum Richards. Occasional in damp woodland and thickets.

Ribes lacustre (Pers.) Poir. Rare, noted only in shaded ravine north of Colin Lake; first record for Canadian Shield in Alberta.

Ribes oxyacanthoides L. Found on dry rocky ridges at Shelter Point and near Sand Point; also at the base of grassy slopes in shrubbery west of Colin Lake.

Amelanchier alnifolia Nutt. Occasional on drier sites, both open and wooded.

Fragaria vesca L. Noted only once on island, northwest arm of Wylie Lake, WL4; first record for Canadian Shield in Alberta.

Fragaria virginiana Duchesne ssp. glauca (S.Wats.) Staudt. Scarce in dry open woodlands on sandy soil; first records for Kazan Upland in Alberta.

Potentilla anserina L. Found at Shelter Point.

Potentilla arguta Pursh Uncommon on open rock outcrops and on sandy lake shores.

Potentilla hookeriana Lehm. Noted only in sage grassland south of Woodman Lake, WM82; first record for northeastern Alberta, otherwise confined to the Rocky Mountains.

Potentilla multifida L. Only two previous localities known in Alberta. Found on dry rocky ridges at Shelter Point, where apparently fairly common. Also found at WL4, island in northwest arm of Wylie Lake. Confined to the Canadian Shield.

Potentilla nivea L. Reported from Fort Chipewyan and Sand Point, confirmed in Flora of Canada but not revised Flora of Alberta; disjunct from main range in the Rocky Mountains.

Potentilla norvegica L. Occasional on sandy lake shores.

Potentilla palustris (L.) Scop. Scarce in wetter bogs and swamps.

Potentilla pensylvanica L. Found on dry rocky ridges at Shelter Point and in grasslands in the vicinity of Colin Lake. Apparently disjunct in this region from grassland and parkland areas further south and west.

Potentilla tridentata Ait. Common in sandy and rocky pine woodland.

Prunus pensylvanica L.f. Occasional on exposed sandy hillsides and beach ridges.

Rosa acicularis Lindl. Occasional in open woodlands.

Rubus arcticus L. ssp. acaulis (Mx.) Focke. Frequent in bogs and damp woodlands.

Rubus chamaemorus L. Common in bogs.

Rubus idaeus L. ssp. melanolasius Focke. Local, in drier woodlands.

Sorbus scopulina Greene Apparently rare away from the Foothills and Rocky Mountain natural regions in Alberta; one collection on the north shore of Lake Athabasca, Sand Point.

Astragalus striatus Nutt. Noted only in open aspen woods south of Woodman Lake on south-facing slope, where common; first record for Canadian Shield in Alberta.

Lathyrus ochroleucus Hook. Found on the sandy north shore of Lake Athabasca at Shelter Point.

Geranium bicknellii Britt. Found near Sand Point.

Callitriche hermaphroditica L. Apparently scarce, found in sheltered bay on island in Wylie Lake, WL2; first record for Canadian Shield in Alberta.

Callitriche verna L. Found in pools at Shelter Point and Sand Point.

Empetrum nigrum L. Fairly common in rocky and sandy woodlands.

Impatiens noli-tangere L. Found at Chipewyan; material collected at edge of birch swamp by Wylie Lake is too immature to determine species.

Hypericum majus (Gray) Britt. Only five collections previously reported for Alberta. Found on the sandy north shore of Lake Athabasca at Shelter Point and Sand Point. Also found in unique wetland north of Colin Lake, CL60.

Hudsonia tomentosa Nutt. Found at Shelter Point and Sand Point, where apparently common. Also found in burn at Wylie Lake and on sands around unique wetland north of Colin Lake.

Viola adunca J.E. Smith Recorded at Shelter Point, grassy slope CL58, and in meadow by unique wetland north of Colin Lake, CL62.

Viola palustris L. Recorded at Sand Point. Rare in moist shady deciduous woodlands and along muddy shores.

Viola renifolia A. Gray Rare in moist shady deciduous woodland; Wylie Lake, Chipewyan.

Shepherdia canadensis (L.) Nutt. Occasional in sandy open woodlands and meadows.

Epilobium angustifolium L. Locally abundant on sandy soils, especially in burns.

Epilobium ciliatum Raf. Occasional in marshes.

Epilobium palustre L. Rare in Picea-Ledum-Sphagnum bogs and along shores.

Myriophyllum exalbescens Fern. Fairly common in shallow water in lakes; first records for Canadian Shield in Alberta.

Hippuris vulgaris L. Found in pool in Picea-Ledum-Sphagnum at Shelter Point. Scarce in shallow water marshes and pools in bogs at Wylie Lake.

Aralia nudicaulis L. Locally common in moist and mesic woodlands.

Cicuta bulbifera L. Local in marshy areas along lakes and streams; first records for Kazan Upland in Alberta.

Cicuta virosa L. Uncommon in northern Alberta. Found at Shelter Point and along streams in vicinity of Woodman Lake.

Sium suave Walt. Fairly common in wet meadows and marshes along lake shores and creeks.

Cornus canadensis L. Common in sandy and rocky woodlands.

Cornus stolonifera Mx. Noted only in shrubbery at base of grassy slope west of Colin Lake; first record for Canadian Shield in Alberta.

Chimaphila umbellata (L.) Bart. Known in Alberta only from the Rocky Mountains, Cypress Hills and Lake Athabasca regions. Found at Fort Chipewyan in sandy spruce woods.

Orthilia secunda (L.) House Fairly common in woodlands.

Pyrola asarifolia Mx. Rare, in open dry woodlands.

Pyrola chlorantha Sw. Found only in woodland and shrubbery at base of grassy slope west of Colin Lake; first records for Kazan Upland in Alberta.

Pyrola elliptica Nutt. Found at Sand Point.

Pyrola minor L. Occasional in a variety of moist and dry woodlands; found once along stream edge.

Monotropa uniflora L. Found in woods along shore just east of Fort Chipewyan; uncommon in Alberta.

Andromeda polifolia L. Fairly common in bogs.

Arctostaphylos rubra (R. & W.) Fern. Rare in Picea-Ledum-Sphagnum bogs; first records for Canadian Shield in Alberta; Rocky Mountains and far northern Alberta.

Arctostaphylos uva-ursi (L.) Spreng. Common in open sandy or rocky woodlands.

Chamaedaphne calyculata (L.) Moench Dominant dwarf shrub in swamps.

Kalmia polifolia Wang. Occasional in bogs.

Ledum groenlandicum Oeder Dominant understory shrub in bogs.

Ledum palustre L. Uncommon in Alberta; far northern species. Recorded near Sand Point.

Oxycoccus microcarpus Turcz. Fairly common in bogs on Sphagnum hummocks.

Vaccinium myrtilloides Mx. Common in sandy and rocky woodlands.

Vaccinium uliginosum L. Found at Shelter Point and near Sand Point; uncommon in Alberta; far northern species.

Vaccinium vitis-idaea L. Common in open bogs and open woodlands.

Androsace septentrionalis L. Found at Fort Chipewyan. Otherwise noted only in unique wetland CL51 at Colin Lake.

Lysimachia thyrsiflora L. Occasional along lake shores; first records for Kazan Upland of Alberta.

Primula mistassinica Mx. Apparently rare away from the Rocky Mountain Natural Region in Alberta, only two collections outside this area on the north shore of Lake Athabasca at Shelter Point and Sand Point, where apparently common; local in Alberta.

Trientalis borealis Raf. Found near Sand Point.

Trientalis europea L. Rare, found only in swampy birch woods at WL8, Wylie Lake; first record for Kazan Upland of Alberta.

Gentianella amarella (L.) Borner Found near Sand Point and at Fort Chipewyan.

Menyanthes trifoliata L. Occasional in wetter bogs and swamps and along streams, where sometimes dominant; first records for Kazan Upland of Alberta.

Apocynum androsaemifolium L. Uncommon in dry open sandy sites.

Phacelia franklinii (R.Br.) A. Gray Found near Sand Point and in grasslands in the vicinity of Colin Lake and Woodman Lake.

Mentha arvensis L. Scarce, found in marshes and on sandy shores.

Scutellaria galericulata L. Occasional in marshes, particularly along creeks.

Stachys palustris L. Found at Shelter Point.

Castilleja raupii Pennell Rare, found at Sand Point, and on sandy lake shores and bogs at Wylie Lake and Woodman Lake.

Euphrasia arctica Lange ex Rostrup Apparently rare in northern Alberta; only one collection on the north shore of Lake Athabasca near Sand Point. Otherwise confined to the Rocky Mountains in Alberta.

Limosella aquatica L. Found at Fort Chipewyan and on damp sand at the margin of beach lagoon, Sand Point; apparently rare in northern Alberta.

Melampyrum lineare Desr. Found on the sandy north shore of Lake Athabasca at Shelter Point; most northerly record in Alberta.

Rhinanthus minor L. Found on the sandy north shore of Lake Athabasca at Shelter Point.

Veronica peregrina L. Found on the sandy north shore of Lake Athabasca at Shelter Point.

Veronica scutellata L. Noted only in sedge interdunal depression south of Woodman Lake, WM 87, where common; first record for Canadian Shield in Alberta.

Pinguicula villosa L. Scarce, on Sphagnum fuscum hummocks in Picea-Ledum-Sphagnum bogs; first records for northeastern Alberta; two previous localities for Alberta.

Utricularia intermedia Hayne Local in marshes and in wetter depressions and pools in bogs and swamps; first records for Kazan Upland of Alberta.

Utricularia vulgaris L. Local in marshes and in wetter depressions and pools in bogs and swamps; first records for Kazan Upland of Alberta.

Plantago major L. Found at Shelter Point.

Galium boreale L. Found at Shelter Point.

Galium trifidum L. Occasional in swamps, marshes and wetter bogs.

Linnaea borealis L. Common in mesic to moist woodlands.

Lonicera dioica L. Found only in shrubbery at base of grassy slope west of Colin Lake; first record for Kazan Upland in Alberta.

Symphoricarpos albus (L.) Blake Found at Fort Chipewyan and near Sand Point.

Viburnum edule (Mx.) Raf. Frequent in moist woodlands.

Campanula rotundifolia L. Common in drier rocky and sandy woodlands.

Achillea millefolium L. Found at Shelter Point and at edge of pine woods along stream channel between Colin Lake and Woodman Lake.

Achillea sibirica Ledeb. Found at Shelter Point. Also noted on island, northwest arm of Wylie Lake, WL4.

Antennaria neglecta Greene Scarce on dry rocky ridges and open jack pine woods.

Antennaria parvifolia Nutt. Found at Shelter Point, unique wetland meadow CL62, and at edge of birch stand on gull nesting island in Colin Lake.

Antennaria rosea Greene Occasional in sandy woodlands and on sandy shores.

Antennaria umbrinella Rydb. Only one record away from this species' main range in the Rocky Mountains, on the north shore of Lake Athabasca.

Arnica alpina (L.) Olin ssp. attentuata (J. Macoun) Maguire = Arnica attenuata Greene Found only on an island in the northwest arm of Wylie Lake, WL4; apparently the first Alberta record of this subspecies or species, depending on taxonomy.

Arnica lonchophylla Greene Occasional in open sandy and rocky woodlands.

Artemisia campestris L. Occasional in pine woods and on drier sandy exposed hillsides, occasionally forming the predominant ground cover.

Artemisia frigida Willd. Found at Shelter Point. Dominant in some grasslands in the vicinity of Colin Lake and Woodman Lake.

Aster borealis (T. & G.) Prov. Found at Sand Point.

Erigeron acris L. ssp. politus (E. Fries) S. & K. Scarce, on muddy and sandy shores.

Hieracium umbellatum L. Found at Fort Chipewyan, Sand Point, Shelter Point and unique wetland north of Colin Lake, CL60.

Petasites palmatus (Ait.) A. Gray Occasional in moist woodland; first records for Canadian Shield in Alberta.

Petasites sagittatus (Pursh) A. Gray Scarce in marshes and swamps; first records for Kazan Upland of Alberta.

Senecio congestus (R.Br.) DC. Found at Shelter Point and along shore of lake west of Colin Lake.

Senecio indecorus Greene Found at Shelter Point, at edge of birch stand on gull nesting island in Colin Lake, and at edge of kettle lake south of Woodman Lake.

Senecio streptanthifolius Greene Occasional in open woodland on sandy soil and rock outcrops.

Solidago canadensis L. Found on the sandy north shore of Lake Athabasca at Shelter Point, Sand Point and Fort Chipewyan.

Solidago graminifolia (L.) Salisb. Found on the sandy north shore of Lake Athabasca at Shelter Point and Sand Point.

Solidago nemoralis Ait. Found at Fort Chipewyan and on open grassy slope at east end of Colin Lake; apparently rare in northern Alberta.

Solidago spathulata DC. Occasional on dry rocky ridges, grassy slopes, and dry open pine woods.

Tanacetum huronense Nutt. Only two records for Alberta. Confined to the Canadian Shield. Found on the sandy north shore of Lake Athabasca at Shelter Point and Sand Point.

Taraxacum officinale Weber Rare, on sandy lake shores.

Mosses

The following is a listing of mosses noted during the course of this study. It is not an exhaustive treatment but does give a representation of the major species.

Bartramia pomiformis Hedw. Found on rock outcrops.
Bryum pseudotriquetrum (Hedw.) G., M. & S. Pioneering species of exundated sands and burned areas.
Cynodontium tenellum (B.S.G.) Limpr. Occurs on rock outcrops.
Dicranum spp. Locally common in black spruce woods.
Drepanocladus exannulatus (B.S.G.) Warnst. Common in wetter swamps and bogs.
Drepanocladus tundrae (H. Arnell) Loeske Found only in swamp at east end of Wylie Lake.
Hedwigia ciliata (Hedw.) P. Beauv. Found on rock outcrops.
Hylocomium splendens (Hedw.) B.S.G. Locally common in black spruce woods.
Pleurozium schreberi Dominant species in black spruce woodlands.
Polytrichum commune Hedw. Locally common in black spruce woodlands.
Polytrichum juniperinum Hedw. Common in woodlands and on rock outcrops.
Polytrichum strictum Brid. Found in open woodland and on rock outcrops.
Ptilium crista-castrensis Locally common in black spruce woodlands.
Sphagnum angustifolium (Jens. ex Russ.) Jens. in Tolf Found in moister depressions in drier bogs.
Sphagnum contortum Schultz. Found only in wetland north of lake west of Colin Lake; at edge of open pool.
Sphagnum fuscum (Schimp.) Klinggr. The most common moss in dry bogs.
Sphagnum girgensohnii Russ. Found in wetter portions of bogs.
Sphagnum nemoreum Scop. Fairly common in moister depressions in drier bogs.
Sphagnum obtusum Warnst. Noted only in swamp at east end of Wylie Lake.
Sphagnum squarrosum Crome Found only in swamp at east end of Wylie Lake.
Sphagnum teres (Schimp.) A. & H. Found in wetter shaded portions of bogs and swamps.
Thuidium abietinum (Hedw.)B.S.G. Occurs in drier woodlands.

Lichens

The following is a listing of the major species of lichens noted during the study. Due to difficulties in obtaining identifications, crustose species form a minor component of this list.

Bryoria spp. Found on black spruce twigs and rock outcrops.
Bryoria chalybeiformis (L.) B. & H. Found on rocks at waterline.
Bryoria fuscescens (Gyeln.) B. & H. Common on rock outcrops.
Caloplaca murorum (Hoffm.) Th. Fr. Common at waterline on rocks.
Cetraria cucullata (Bell.) Ach. Found in open woodlands.
Cetraria islandica (L.) Ach. Common in open woodlands and on rock outcrops.
Cetraria nivalis (L.) Ach. Common in open woodlands and on rock outcrops.
Cetraria pinastri (Scop.) S. Gray Found on twigs.
Cladina alpestris (L.) Harm. Common in open woodlands.
Cladina mitis (Sandst.) H. & C. Common in open pine woodlands.
Cladina rangiferina (L.)Harm. Common in open pine woodlands.
Cladonia spp. Common in dry woodlands and rotting logs.
Cladonia amaurocraea (Florke) Schaer. Common in open woodlands and rock outcrops.
Cladonia pyxidata (L.) Hoffm. Found in drier woodlands.
Cladonia uncialis (L.) Wigg. Common in open woodlands and rock outcrops.
Dermatocarpon miniatum (L.) Mann Common on rock outcrops.
Evernia mesomorpha Nyl. Found on black spruce twigs.
Lecanora spp. Found on rock outcrops.
Parmelia spp. Found on rock outcrops.
Parmelia saxatilis (L.) Ach. Found on rock outcrops.
Peltigera canina (L.) Willd. Common on rock outcrops and in drier woodlands.
Peltigera spuria (Ach.) DC. Found on rock outcrops.
Platismatia glauca (L.) C. & C. Occurs on rock outcrops.
Rhizocarpon spp. Found on rock outcrops.
Stereocaulon spp. Common in open woodlands.
Stereocaulon tomentosum Fr. Common in open woodlands and on rock outcrops.
Umbilicaria spp. Common on rocks.
Umbilicaria proboscidea (L.) Schrad. Found on rock outcrops.
Usnea spp. Common on black spruce twigs.

APPENDIX B: ANNOTATED LIST OF MAMMALS

A total of 19 species are included. Eight species were recorded during the study period; eight species were added from fur harvest data for the past 13 winters; three were added from Saskatchewan Kazan Upland records (Harper, 1932); and one was added from Soper (1964). Nomenclature and order is according to Banfield (1974). Unless specified, information pertains to field data from July, 1983.

Snowshoe Hare: Uncommon. Individuals in mixed spruce-pine-birch-aspen and mature black spruce-feather moss. Sign in recent burn.

American Red Squirrel: Local. Common in old pine, in an old burn complex (i.e., immature pine stands of varying ages) and in an old white spruce stand. Also recorded in open pine-alder and mature pine-black spruce. Rarely trapped in the field study areas.

American Beaver: Uncommon. One individual, two bank lodges and very little old cuttings. Commonly trapped in the Woodman Lake and Colin Lake areas.

Deer Mouse: Reported in Saskatchewan by Harper.

Gapper's Red-backed Vole: Reported by Harper in Saskatchewan.

Muskrat: Only one seen, but commonly trapped in the Woodman Lake and Colin Lake areas.

Coyote: Small number trapped in the Wylie Lake area during one winter.

Wolf: Tracks of young and adults on shore, and at least three howling, Colin Lake; scat at Woodman Lake on cutline and animal trails, in mature spruce-pine. Regularly trapped, in small numbers, in the Colin Lake and Woodman Lake areas. Soper thought that wolves moved out of Wood Buffalo Park area into the Kazan Upland, in winter, to prey on Caribou, in years when they were present; and that wolves may also have moved south in winter into the Kazan Upland from the N.W.T. by following caribou herds.

Arctic Fox: Winter visitor. "White fox", presumably this species, were reported in two winters in the Colin Lake and Woodman Lake areas. Soper writes that winter movement of this species was closely associated with Caribou migration, sometimes reaching south of Lake Athabasca.

Red Fox: "Red", "Silver" and "Cross" phases regularly trapped in all the field study areas, but less regularly at Wylie Lake.

American Black Bear: Sign on animal trails and cutline in mature spruce-pine, and also in mature pine-alder, and immature pine in old burns.

American Marten: According to Soper, populations were low in the Kazan Upland in the 1930s, until at least 1964. From 1970-1975, present in only 1% of traplines in Mapsheet 74M, which includes the entire study area (Boyd 1977). Generally scarce in northern Alberta (Soper).

Fisher: A small number trapped in one winter in the Wylie Lake area. Generally scarce in northern Alberta (Soper).

American Mink: Commonly trapped in the Woodman Lake and Wylie Lake areas, but less commonly around Wylie Lake.

Wolverine: Small numbers trapped in the Woodman Lake and Colin Lake areas for several winters. Generally scarce in northern Alberta (Soper).

River Otter: Trapped in small numbers for several winters in all the field study areas. Generally scarce in northern Alberta (Soper).

Lynx: Commonly trapped in the Colin Lake and Woodman Lake areas, but less regularly in the Wylie Lake area.

Caribou (Barren-ground subspecies): Winter visitor. Old antlers in old pine in the Wylie Lake and Colin Lake areas indicate that this species had visited these areas in recent years. Preferred winter habitat is older forest, and forage plants include fruticose and foliose lichens (including Cetraria nivalis) and bog cranberry (Vaccinium vitis-idaea) (Scotter 1970). Prior to about 1911, once in every 10 years Caribou moved south into the Kazan Upland in Alberta in large numbers, moving as far south as Burntwood Island and Bustard Island in Lake Athabasca (Harper). Since 1911, their migrations have been less predictable and their numbers smaller. In 1967, small numbers of primarily old bulls, part of a section of the Beverly herd, were present in Alberta only in the extreme northeast corner, northeast of Charles Lake (Thomas 1969). In the winters of 1980-81 and 1982-83, relatively larger numbers were found in the Kazan Upland of Saskatchewan than had been seen in the recent past (George Scotter, October 1983, personal conversation).

Moose: A cow with twins, and two individuals (including a bull feeding in sedges in shallow water) at Wylie Lake, and a cow and calf in shallow water at Colin Lake. Droppings found in mature pine-alder, immature pine, spruce-tamarack-birch wet bog, mature pine, recent burn and along animal trails and cutline in mature black spruce-pine. A well-used wallow was located at the interface of a bog and a lake shore.

APPENDIX C: ANNOTATED LIST OF BIRDS

The following is a list of breeding or potentially breeding birds for the Kazan Upland, Alberta, and the corresponding area in Saskatchewan (north of Lake Athabasca and west of 108 degrees longitude). It is based mainly on field work conducted in July, 1983, with additional information from papers by Nero (1963, 1967), Hohn (1971, 1973), Bishoff and Fyfe (1975), and Salt and Salt (1976), and from personal conversations in Edmonton with Otto Hohn (November 1983). A total of 124 species are listed, of which 78 were recorded during this study. At least three species, recorded in 1983, were apparently the first for the Kazan Upland in Alberta; at least eight species were apparently the first records for the Kazan Upland in Alberta and Saskatchewan. In 1983, evidence for nesting was found for 27 species, designated with an asterisk (*). Nesting records for two species represent the first or second records for Alberta.

Arctic Loon: Very local on small lakes. Nested near Leland Lakes, 1971 (Hohn). Breeding range in Alberta restricted to Kazan Upland and Caribou Mountains.

*Common Loon: Common on larger deeper lakes.

*Horned Grebe: Scarce. One pair with newly hatched young on kettle pond, Woodman Lake, July 9. Nested just north of Lake Athabasca, Saskatchewan (Nero).

Red-necked Grebe: Nested just north of Lake Athabasca, Saskatchewan (Nero). Reported from Leland Lakes in early July 1971 (Hohn).

American Bittern: Breeding record for Saskatchewan (Nero).

Canada Goose: One adult at kettle pond just northeast of Colin Lake, July 5. Nests locally in Saskatchewan (Nero).

Green-winged Teal: Nested just north of Lake Athabasca, Saskatchewan (Nero).

*Mallard: Most common dabbling duck. In shallow water of small lakes and channels connecting lakes. Occasional near islands in larger lakes.

Northern Pintail: Nest found on island in Lake Athabasca, Alberta in 1971 (Hohn).

Northern Shoveler: Recorded north of Lake Athabasca, Saskatchewan (Nero).

Gadwall: Small flock over Colin Lake, July 5. Apparently first record for Kazan Upland. Generally rare in northern Alberta.

American Wigeon: Local. Shallow eutrophic lakes. Nested just north of Lake Athabasca, Saskatchewan (Nero). Observed around islands in Lake Athabasca, Alberta in July 1971 (Hohn).

Canvasback: One record, Wylie Lake, 1962 (Nero).

*Ring-necked Duck: Uncommon. Kettle ponds, eutrophic lakes, and swampy stream channels.

Greater Scaup: Three males, two females on small kettle pond, just northeast of the large unnamed lake west of Colin Lake, July 7. Comprised large portion of flock of 400-500 scaup, Woodman Lake, July 10. Apparently first records for Kazan Upland. Rare in Alberta, and breeding unconfirmed.

Lesser Scaup: Present in large flocks and small groups, Woodman Lake area. One unidentified pair of scaup, Wylie Lake. Downy young seen at Leland Lakes in 1971 (Hohn).

Surf Scoter: Common, north shore Lake Athabasca, Saskatchewan (Nero). One female at Leland Lakes in mid-July 1971 (Hohn).

Common Goldeneye: Recorded in mid-July 1971 at Leland Lakes (Hohn).

Bufflehead: Uncommon. Ponds, large lakes, kettle lakes, but mostly eutrophic lakes.

Hooded Merganser: Scarce. Two females, Colin Lake, July 7. Apparently first record from Kazan Upland. Generally rare in northern Alberta where nesting is unconfirmed.

Common Merganser: Common on large lakes.

Red-breasted Merganser: Fairly common on large lakes. Commonest duck, north shore Lake Athabasca, Saskatchewan (Nero). Documented breeding range in Alberta restricted to the Caribou Mountains and the extreme northeast.

Osprey: Very local at large lakes (Bishoff and Fyfe).

*Bald Eagle: Fairly common around large lakes. Nests on wooded islands. Highest nesting density in Alberta is in the Kazan Upland.

Northern Harrier: Reported just north of Lake Athabasca, Saskatchewan (Nero).

Sharp-shinned Hawk: Scarce. One adult, Colin Lake, July 10. Apparently first record for Kazan Upland.

Northern Goshawk: Nests in Saskatchewan (Nero). Feather, believed to be of an immature of this species, found at Woodman Lake. Seen at Andrew Lake, mid-July 1970 (Hohn).

Broad-winged Hawk: Reported just north of Lake Athabasca, Saskatchewan (Nero).

Red-tailed Hawk: Very local. Just north of Lake Athabasca, Saskatchewan (Nero). Fidler Point, Lake Athabasca, July 11.

Golden Eagle: Locally nesting in vicinity of cliffs , southeast part of Alberta Kazan Upland. Needs open areas with small mammals for foraging (Bishoff and Fyfe). Generally rare in northern Alberta.

American Kestrel: Uncommon. Open wooded situations at bog edges and on south-facing slopes.

Peregrine Falcon: Local summer resident in vicinity of steep sloping cliffs near water, near Lake Athabasca. Marshy and open areas are important for foraging (Johnston-Beaver, 1979). Extremely rare in Alberta; threatened species.

*Spruce Grouse: Family group at edge of black spruce bog and female in pine barrens, Wylie Lake. Great deal of unidentified grouse droppings in pine barrens.

Willow Ptarmigan: Known to regularly move through and winter in the area, so some of the sign mentioned under the previous can probably be attributed to this species.

Ruffed Grouse: Very local in Saskatchewan (Nero).

Sharp-tailed Grouse: Breeds locally in Saskatchewan (Nero).

Sora: Heard at Leland Lakes, mid-July 1971 (Hohn).
Sandhill Crane: Very local. Reported from Loutit Lake area (Bishoff and Fyfe). Heard near Leland Lakes, mid-July 1971 (Hohn).
*Semipalmated Plover: Very local and uncommon. Three adults and at least one brood of downy young, sandy shores of kettle pond, northeast of Colin Lake, July 5. Second nesting record for Alberta. Breeding range in Alberta restricted to the extreme northeast.
*Killdeer: Local and uncommon on pond and lake shores.
Greater Yellowlegs: Fairly common. Lakeshores, especially at bog and swamp edges.
Lesser Yellowlegs: Local and uncommon. Lakeshores, especially at bog and swamp edges.
Solitary Sandpiper: Local and uncommon. Pond and lake shores.
Least Sandpiper: Scarce. One on shore of wooded island, Woodman Lake, July 10; two in muskeg, Burntwood Island, Lake Athabasca, July 2, 1971; also recorded at Leland Lakes, mid-July 1971 (Hohn).
*Common Snipe: Local and uncommon in sedge wetlands and wet bogs.
Red-necked Phalarope: Report of two just north of Lake Athabasca, Saskatchewan (Nero).
Pomarine Jaeger: One reported from Fidler Point, Lake Athabasca, June 3, 1969 (Hohn). Hypothetical species in Alberta.
Parasitic Jaeger: Regular summer visitor, Lake Athabasca, Saskatchewan (Nero). Two seen near islands in Lake Athabasca, Alberta in early July 1971 (Hohn).
Long-tailed Jaeger: Reported Lake Athabasca, Saskatchewan (Nero).
Franklin's Gull: Mixed nesting colony of this species and Bonaparte's Gulls at Loutit Lake, S.E. part of Alberta Kazan Upland (Bishoff and Fyfe). Most northern breeding record in Canada.
*Bonaparte's Gull: Uncommon. Small numbers around islands in lakes, nesting in black spruce.
*Mew Gull: Local and uncommon on larger lakes. At least two pairs, Colin Lake. Nest with pipped egg on tiny island, July 11, at the southeast arm Colin Lake, is the first documented nesting record for Alberta. Reported from Lake Athabasca, Alberta and Leland Lakes in July 1971 (Hohn). Nests in colonies, Lake Athabasca. Saskatchewan (Nero), and also nests at Fort Smith, N.W.T.
Ring-billed Gull: Uncommon summer visitor to larger lakes.
California Gull: Scarce summer visitor to larger lakes. Nests commonly in colonies, Lake Athabasca (Hohn).
*Herring Gull: Commonest gull species, nesting in small numbers on small islands in larger lakes.
Caspian Tern: Very local. Nests on Egg island, Lake Athabasca, and reported from the Charles Lake area (Bishoff and Fyfe). Breeding range in Alberta confined to Canadian Shield.
*Common Tern: Uncommon around larger lakes around islands, feeding over open water.
Arctic Tern: Scarce summer visitor. At least two adults feeding close to shore with Common Terns and gulls, northeast shore Colin Lake, July 5. Nests Lake Athabasca, Saskatchewan (Nero). Nesting unconfirmed for Alberta.
Great-horned Owl: Reported just north of Lake Athabasca, Saskatchewan (Nero).

Northern Hawk-Owl: Scarce. One adult in old birch-spruce stand, adjacent bog, Wylie Lake, July 2.
Barred Owl: Reported just north of Lake Athabasca, Saskatchewan (Nero).
Great Gray Owl: Fall report just north of Lake Athabasca, Saskatchewan (Nero). Feather, believed to be of this species, found in large bog, Woodman Lake.
Boreal Owl: Reported just north of Lake Athabasca, Saskatchewan (Nero).
Common Nighthawk: Uncommon. Observed feeding and calling over pine woods.
Belted Kingfisher: Uncommon and local. In vicinity of eroding banks near water.
Yellow-bellied Sapsucker: Local and scarce. Old work on birch, Wylie Lake. Nest, Leland Lakes, 1971 (Hohn).
Downy Woodpecker: Reported in winter just north of Lake Athabasca, Saskatchewan (Nero).
Three-toed Woodpecker: Possibly nests in Saskatchewan (Nero).
Black-backed Woodpecker: One female, July 4, Wylie Lake at edge of recent burn. Much sign (scaled-off bark) of this species or the Three-toed Woodpecker in the general vicinity.
*Northern Flicker: Uncommon. Wooded islands, lake shore woods, pine and bog forest edge.
Pileated Woodpecker: Reported just north of Lake Athabasca, Saskatchewan (Nero). Possible old work in old forest, Woodman Lake and Colin Lake.
Hairy Woodpecker: Reported just north of Lake Athabasca, Saskatchewan (Nero). Possible old work in old forest, Woodman Lake. Reported from Leland Lake, mid-July 1971 (Hohn).
Olive-sided Flycatcher: Uncommon and local. Mixed pine-spruce slope woods and lake shore spruce-pine.
Western Wood Pewee: Reported just north of Lake Athabasca, Saskatchewan (Nero).
Alder Flycatcher: Local and uncommon. Restricted to thick shrubbery along swampy channels between lakes.
*Eastern Phoebe: Uncommon. Inconspicuous but present in rocky cliffs along lake shores, and also recorded on a wooded island near an old cabin.
Eastern Kingbird: Nested just north of Lake Athabasca, Saskatchewan (Nero).
*Tree Swallow: Local. Around wooded islands and swampy channel-lake interfaces.
Barn Swallow: Reported just north of Lake Athabasca, Saskatchewan (Nero).
*Gray Jay: Common in a wide range of woodland types.
Black-billed Magpie: Reported just north of Lake Athabasca, Saskatchewan (Nero).
American Crow: Reported just north of Lake Athabasca, Saskatchewan (Nero).
*Common Raven: Local and uncommon. Individuals infrequently recorded in flight, and a small flock of adults and immatures frequented shore of Colin Lake.
Black-capped Chickadee: Reported just north of Lake Athabasca, Saskatchewan (Nero).
*Boreal Chickadee: Uncommon. Black spruce, old pine-black spruce, and

mixed pine-spruce-birch-aspen.

Red-breasted Nuthatch: Scarce. One in black spruce along swampy channel, Wylie Lake. Reported just north of Lake Athabasca, Saskatchewan (Nero).

*Ruby-crowned Kinglet: Fairly common. Black spruce at bog edges and lake shores, and old spruce-pine.

Swainson's Thrush: Locally common. Shrubby black spruce along swampy lake shores and stream channels, and occasionally dense immature pine-alder, and pine-birch-spruce on rocky slopes.

Hermit Thrush: Fairly common. Mature pine, recent and old burns (immature pine), and spruce-pine-birch-aspen.

American Robin: Local and uncommon. Old pine and spruce, and also on a wooded island.

Bohemian Waxwing: Uncommon. Small groups in black spruce at bog and swamp edges.

Cedar Waxwing: Scarce. Two flying over swampy channel, Colin Lake, July 5. Reported just north of Lake Athabasca, Saskatchewan (Nero). Apparently first record for Kazan Upland in Alberta.

Northern Shrike: Possible breeding record near Kazan Lake, Saskatchewan (Salt and Salt). There is an old breeding record from Spotted Lake, Alberta (Macoun), but it is unclear whether this is in the Delta or the Kazan Upland.

Solitary Vireo: Local and uncommon. Pine-birch-spruce on slope, and pine-alder.

Red-eyed Vireo: Local and uncommon. Birch and aspen stands along lake shores and on kettle slopes, and mixed spruce-pine-birch-aspen.

Tennessee Warbler: Locally common in bog edge and swampy woods along lake shores and stream channels.

Orange-crowned Warbler: Common in pine-birch stands, especially on slopes, and in older burns; occasional at edges of swamp and bog forest along lake shores.

*Yellow Warbler: Characteristic of wooded islands in lakes (one to two pairs an island), but very local along swampy stream channel shrubbery.

Magnolia Warbler: Local and uncommon. Swampy lake shore and stream channel woods.

*Yellow-rumped Warbler ("Myrtle" race): Common in older spruce and pine woods, especially along lake shores and streams; also present in spruce-pine-birch-aspen, and occasional on wooded islands.

*Palm Warbler: Fairly common in immature woods of burn areas, and spruce-tamarack bogs; occasional in lake shore-bog interfaces.

Blackpoll Warbler: Possibly nested just north of Lake Athabasca, Saskatchewan (Nero).

American Redstart: Local and uncommon in woods and shrubbery along swampy stream channels. Apparently first records for Kazan Upland.

Northern Waterthrush: Very local and uncommon. Mixed coniferous-deciduous wood-lake shore edges north of Woodman Lake. Reported in July just north of Lake Athabasca, Saskatchewan (Nero). Apparently first records for Kazan Upland in Alberta.

Wilson's Warbler: Scarce. One singing in extensive willow-dwarf birch along swampy stream channel east of Woodman Lake. Reported in June just north of Lake Athabasca, Saskatchewan (Nero). Apparently first record for Kazan Upland in Alberta.

Western Tanager: Scarce. One singing on west shore of Colin Lake, July 11.

*Chipping Sparrow: Common in pine, edges of black spruce and mixed woods, especially along streams and lake shores.

Clay-colored Sparrow: Very local and uncommon. Extensive dwarf birch-willow along swampy stream channel, east Woodman Lake.

Savannah Sparrow: Local and uncommon. Restricted to extensive areas of wet sedge growth and low shrubbery.

LeConte's Sparrow: Local and uncommon. Restricted to extensive areas of wet sedge growth and low shrubbery. Apparently first records from Kazan Upland.

Fox Sparrow: Scarce. One singing from swampy shrubby, woods along stream channel, northeast side Wylie Lake, July 2 and 3. Apparently first record for Kazan Upland in Alberta.

Song Sparrow: Restricted to wooded islands in lakes (one to two pairs an island). Apparently first records for Kazan Upland. Reported on islands in Lake Athabasca, Alberta in 1971 (Hohn).

*Lincoln's Sparrow: Common in swampy situations along stream channels and, more locally, lake shores.

Swamp Sparrow: Local but fairly common, along swampy edges of stream channels.

White-throated Sparrow: Local and uncommon. Birch and pine along stream channel swamp, and mixed lake shore woods. Apparently first records for Kazan Upland.

White-crowned Sparrow: Reported in August near northeast shore Lake Athabasca, Saskatchewan (Nero). Has nested at Fort Chipewyan. Apparently rare in northern Alberta.

*Dark-eyed Junco ("Slate-colored" race): Fairly common in old pine and pine-spruce, and old and recent burns.

*Red-winged Blackbird: Local and uncommon in wet sedges and shrubbery along swampy channels.

Rusty Blackbird: Uncommon along swampy channels, pond shores and islands, in coniferous and mixed woods.

Pine Grosbeak: Reported in July in Saskatchewan (Nero).

Red Crossbill: Uncommon. Several small flocks in vicinity of pine and spruce woods.

White-winged Crossbill: Uncommon. Several small flocks in the vicinity of black spruce woods.

Common Redpoll: Reported in July in Saskatchewan (Nero).

Pine Siskin: Reported just north of Lake Athabasca, Saskatchewan (Nero).

APPENDIX D: ANNOTATED LIST OF AMPHIBIANS

Chorus Frog: A few bright green individuals in dry sedge marsh at the edge of a kettle lake, northeast of Colin Lake.

Wood Frog: A few seen in vegetated lake shore, wet bog, and dry sedge marsh, Wylie Lake and Colin Lake.

Leopard Frog: Several seen along vegetated shoreline and islands of Wylie Lake. A few seen and heard calling at the large lake immediately east of Wylie Lake. Very local in northern Alberta.

APPENDIX E: 1983 KAZAN UPLAND PLANT COLLECTIONS

The following is a list, by collection locality and date, of all plants collected in the Kazan Upland during the 1983 field season. Nomenclature follows Moss (1983). Specimens have been placed at University of Alberta Herbarium and with the Natural Areas Program.

Numbers not preceded by a WL, CL, or WM refer to numbers of field data sheets on file with the Natural Areas Program and include some study plots where no collections were made.

All WL collection localities fall within the following latitudes and longitudes: 59°19'20"N to 59°21'00"N latitude and 110°16'40"W to 110°24'00"W longitude. CL collection localities occur between 59°32'40"N to 59°37'40"N latitude and 110°01'40"W to 110°20'00"W longitude. WM collection localities are found between 59°30'00"N and 59°34'40"N latitude and 110°22'30"W and 110°29'20"W longitude.

Wylie Lake

July 2

First bog north of eagle nest - WL1

- Equisetum fluviatile L.
- Poa pratensis L. (agassizensis)
- Carex aquatilis Wahl.
- Carex curta Good
- Carex disperma Dewey
- Carex heleonastes Ehrh.
- Carex limosa L.
- Carex tenuiflora Wahl.
- Eriophorum brachyantherum Trautv.
- Salix pedicellaris Pursh
- Stellaria longifolia Muhl.
- Andromeda polifolia L.
- Oxycoccus microcarpus Turcz.
- Menyanthes trifoliata L.
- Utricularia intermedia Hayne

Sheltered bay on island - WL2

- Callitriche hermaphroditica L.

North-facing cliff by water - WL3

- Polypodium virginianum L.

Northwest island - WL4

- Festuca saximontana Rydb.
- Poa pratensis L. (P. alpigena (Fries.) L.f.
- Juncus vaseyi Engel.
- Salix bebbiana Sarg.

Salix planifolia Pursh
Fragaria vesca L.
Potentilla multifida L.
Achillea sibirica Ledeb.
Arnica alpina (L.) Olin ssp. attentuata (Greene) Maguire = A. attenuata Greene

Northwest arm; Chamaedaphne bog by beaver pond - WL5
Calamagrostis canadensis (Mx.) Beauv.
Corallorhiza trifida Chat.

Stream edge with Arum - WL6
Rubus arcticus L. ssp. acaulis
Pyrola minor L.

Stream channel between lakes - WL7
Potamogeton alpinus Balbis (also on July 4)
Potamogeton richardsonii (Benn.) Rydb.
Carex buxbaumii Wahl.
Salix planifolia Pursh (July 3)
Ranunculus circinatus Sibth. (July 4)
Sium suave Walt.
Myriophyllum exalbescens Fern.

Swamp/bog edge - WL8
Glyceria striata (Lam.) Hitchc.
Rumex occidentalis Wats.
Impatiens cf. noli-tangere L.
Trientalis europea L.
Viburnum edule (Mx.) Raf.

Dry slope - WL9
Oryzopsis pungens (Torr.) Hitchc.

Bog edge, Ribes - Ledum - Picea - WL10
Carex curta Good
Ribes hudsonianum Rich.
Orthilia secunda (L.) House
Andromeda polifolia L. (burn)

Picea - Ledum - Sphagnum hummock by wet pool - WL11
Lycopodium annotinum L.
Equisetum sylvaticum L.
Carex norvegica Retz. = C. media R.Br.
Eriophorum brachyantherum Trautv.
Smilacina trifolia (L.) Desf.
Drosera rotundifolia L.
Petasites palmatus (Ait.) Gray

Shaded north-facing cliff overhang by lake north of Wylie Lake - WL12
Gymnocarpium jessoense (Koidz.) Koidz.
Dryopteris fragrans (L.) Schott. (July 3.)

July 3

Lakeshore by camp - WL13

Juncus brevicaudatus (Engelm.) Fern.
Juncus vaseyi Engelm.
Carex curta Good
Carex viridula Mx.
Myrica gale L.
Ranunculus reptans L. = R. flammula
Rorippa palustris (L.) Bess.
Potentilla arguta Pursh
Lysimachia thyrsiflora L.
Castilleja raupii Penn

MF1 - WL14

MF1 to MF2, granite dome lichen burn - WL15

Carex aenea Fern.

MF2 - WL16

Carex diandra Schrank.
Carex paupercula Mx.
Eleocharis palustris (L.) R. & S.
Salix planifolia Pursh
Cicuta bulbifera L.

Open jack pine/rock outcrop by camp - WL17

Juniperus communis L.
Poa glauca Vahl
Alnus crispa (Ait.) Pursh
Corydalis sempervirens (L.) Pers.
Saxifraga tricuspidata Rottb.
Amelanchier alnifolia Nutt.
Vaccinium vitis-idaea L.
Viburnum edule (Mx.) Raf.

Open pine by camp - WL18

Geocaulon lividum (Rich.) Fern.
Empetrum nigrum L.
Vaccinium myrtilloides Mx.

Sheltered bay shoreline - WL19

Carex chordorrhiza L.f.
Carex curta Good.
Carex lenticularis Mx.
Eriophorum brachyantherum Trautv.
Scirpus acutus Muhl. ex. Bigel. = S. lacustris L.
Salix planifolia Pursh

Burn, sandy jack pine - WL20

Calamagrostis canadensis (Mx.) Beauv.
Poa glauca L.
Carex aenea Fern.
Carex deflexa Horn.
Hudsonia tomentosa Nutt.

South-facing rock outcrop - WL21
Dryopteris fragrans (L.) Schott.

Birch woods with alder - WL22
Gymnocarpium dryopteris (L.) Newm.

Betula - *Ledum* bog - WL23
Betula neoalaskana Sarg.
Ledum groenlandicum Oeder

Marsh north of eagle nest - WL24
Carex rostrata Stokes
Scutellaria galericulata L. (on rock outcrop)

N1 - WL21
Woodsia ilvensis (L.) R.Br.
Festuca saximontana Rydb.
Poa glauca L.

N2 - WL17
N3 - WL25
N4 - WL26
Alnus crispa (Ait.) Pursh

N5 - WL27
Equisetum scirpoides Mx.
Salix glauca L.
Salix myrtillifolia Anders.

N6 - WL23
Carex aquatilis Wahl.
Carex paupercula Mx.
Carex tenuiflora Wahl.
Salix myrtillifolia Anders.

N7 - WL22
Carex cf. *loliacea* L.
Carex norvegica Retz. = *C. media*
Alnus tenuifolia Nutt.
Viola renifolia A. Gray (purple capsules)
Pyrola minor L.
Trientalis europea L.

N8 - WL28
Equisetum arvense L.
Carex vaginata Tausch.
Ranunculus lapponicus L.
Ribes hudsonianum Rich.
Viola palustris L. (purple flowers)

N9 - WL29

N10 - WL30
N11 - WL18
N12 - WL20
Calamagrostis canadensis (Mx.) Beauv.
Carex umbellata Schkur. var. *tonsa* Fern.

N13 - WL31
Carex deflexa Hornem.

N14 - WL32
Carex umbellata Schkur. var. *tonsa* Fern.
Salix pyrifolia Anders.

Site 1 - WL33
Site 2 - WL34
Site 3 - WL35
Calamagrostis canadensis (Mx.) Beauv.

Site 4 - WL36
Carex curta Good
Carex paupercula Mx.
Eriophorum polystachion L. = *E. angustifolium*
Salix pedicellaris Pursh
Salix planifolia Pursh
Potentilla palustris (L.) Scop.

Site 5 - WL37
Eriophorum gracile Koch
Rorippa palustris (L.) Bess.
Epilobium ciliatum Raf.
Utricularia intermedia Hayne
Galium trifidum L.
Petasites sagittatus (Banks.) A. Gray

After Site 5, moose wallow - WL38
Triglochin maritima L.
Eriophorum polystachion L. = *E. angustifolium*
Spiranthes romanzoffiana C. & S.
Parnassia palustris L. var. *montanensis* (F. & R.) Hitch.
Aralia nudicaulis L.

After Site 5, lakeshore - WL39
Myrica gale L.
Betula pumila L.
Rosa acicularis Lindl.
Chamaedaphne calyculata (L.) Moench

Site 6 - WL40
Carex diandra Schrank.
Salix pedicellaris Pursh
Betula pumila L.

Site 7 - WL41
Salix glauca L.

July 4
Deep water - WL42
Potamogeton praelongus Wulf.

Colin Lake East
July 4, 1983
Open sandy jack pine/bearberry - CL43
Stellaria longipes Goldie
Artemisia campestris L.

Lagoon behind beach with *Carex aquatilis* - CL44
Sparganium minimum (Hartm.) Fries
Ranunculus gmelinii DC.

Stream channel - CL45
Calla palustris L.
Ranunculus circinatus Sibth.

Picea - *Ledum* bog - CL46
Carex tenuiflora Wahl.
Kalmia polifolia Wang.
Pinguicula villosa L. (on *Sphagnum fuscum* hummock)

Pine-black spruce-lichen - CL47
Lycopodium complanatum L.

Beach, edge of pine woods - CL48
Calamagrostis canadensis (Mx.) Beauv.
Hierochloe odorata (L.) Beauv.
Poa pratensis L.
Ribes glandulosum Grauer

Beach ridge - CL49
Agropyron trachycaulum (Linke) Malte var. *trachycaulum*

Betula nana - *Salix pyrifolia* swamp CL50
Carex diandra Schrank

July 5, 1983
Unique pond - CL51
Calamagrostis purpurascens R.Br.
Glyceria borealis (Nash) Batchc.
Carex cf. *bigelowii* Torr.
Carex crawfordii Fern.
Carex saxatilis L. var. *saxatilis*
Carex umbellata Schkuhr. var. *umbellata*
Juncus vaseyi Engelm.
Betula glandulosa Mx.
Stellaria longifolia Muhl.
Arabis lyrata L. var. *kamchatica* Fisch.

Androsace septentrionalis L.

Young aspen in burn - CL52
Pyrola asarifolia Mx.

Dry pine woods above site 10 - CL53
Calamagrostis purpurascens R.Br.
Anemone multifida Poir.
Fragaria virginiana Duch.
Potentilla norvegica L.
Shepherdia canadensis (L.) Nutt.
Arctostaphylos uva-ursi (L.) Spreng.
Campanula rotundifolia L.

Open pine alder woods - CL54
Maianthemum canadense (L.) Desf.

Bare granite outcrop in pine woods - CL55
Cryptogramma acrostichoides R.Br.
Potentilla tridentata Ait.

Moist woods below 13 - CL56
Ribes lacustre (Pers.) Poir.

Below 13 on open slope - CL 57
Draba nemorosa L. var. leiocarpa Lindbl.

Site 8 - CL58
Calamagrostis purpurascens R.Br.
Carex siccata Dewey
Anemone patens L.
Apocynum androsaemifolium L.
Arctostaphylos uva-ursi (L.) Spreng.
Senecio streptanthifolius Greene

Plot 9 - CL59
Pyrola minor L.
Arnica lonchopylla Greene

Plot 10 - CL60
Agrostis scabra Willd.
Poa pratensis L.
Carex aurea Nutt. = C. garberi Fern.
Carex saxatilis L. var. saxatilis
Carex viridula Mx.
Juncus alpinoarticulatus Ch.
Juncus brevicaudatus (Engelm.) Fern.
Juncus filiformis L.
Juncus vaseyi Engelm.
Arabis lyrata L. var. kamchatica Fisch.
Parnassia palustris L. var. montanensis (F. & R.) Hitchc.
Mentha arvensis L.

Plot 11 - CL61
Carex crawfordii Fern.
Carex lenticularis Mx.
Polygonum amphibium L.
Sagina nodosa (L.) Fenzl.
Hypericum majus (Gray) Britt.
Antennaria rosea Greene
Erigeron acris L. ssp. politus (E. Fries) S. & K.
Hieracium umbellatum L.

Plot 12 - CL62
Botrychium lunaria (L.) Sw.
Botrychium multifidum (Gmel.) Rupr.
Poa pratensis L.
Carex siccata Dewey
Salix brachycarpa Nutt. var. antimima (Schneid.) Raup
Arabis hirsuta (L.) Scop.
Viola adunca J.E. Smith

Site 13 - CL63
Equisetum pratense Ehrh.
Carex siccata Dewey
Draba nemorosa L.
Prunus pensylvanica L.
Artemisia campestris L.
Solidago nemoralis Ait.

Colin Lake West
July 7
Plot 14 - CL64
Potamogeton gramineus L.
Sparganium minimum (Hartm.) Fries
Glyceria borealis (Nash) Batchc.
Eriophorum chamissonis C.A. Meyer
Eriophorum gracile Koch
Utricularia intermedia Hayne
Utricularia vulgaris L.

Plot 15 - CL65
Carex chordorrhiza L.f.
Carex lasiocarpa Ehrh.
Carex limosa L.
Eriophorum chamissonis C.A. Mey.
Salix pedicellaris Pursh
Stellaria longifolia Muhl.

Plot 16 - CL66
Calamagrostis purpurascens R.Br.
Poa canbyi (Scribn.) Piper
Stipa spartea Trin. var. curtiseta Hitchc.
Carex siccata Dewey
Carex supina Wahl. ssp. spaniocarpa (Stud.) Hult.
Arabis holboellii Hornem. var. retrofracta (Grah.) Rydb.

Potentilla pensylvanica L.
Artemisia frigida Willd.
Solidago spathulata DC.

Plot 17 - CL67
Selaginella rupestris (L.) Spring.
Poa interior Rydb.
Stipa spartea Trin. var. curtiseta Hitchc.
Draba nemorosa L. var. leiocarpa Lindbl.
Phacelia franklinii (R.Br.) Gray

White spruce feather moss forest below 16 - CL68
Pyrola chlorantha Sw.

Open buffaloberry-aspen shrubbery below 16 - CL69
Ribes oxyacanthoides L.
Cornus stolonifera Mx.
Pyrola chlorantha Sw.
Lonicera dioica L.

Grassy slope near kettle lakes - CL70
Equisetum hyemale L.
Juniperus horizontalis Moench
Elymus innovatus Beal (in pine)
Festuca saximontana Rydb.
Carex siccata Dewey
Chenopodium leptophyllum (Moq.) Wats.
Silene antirrhina L.
Arnica lonchophylla Greene

Sandy beach near kettle lakes - CL71
Rorippa palustris (L.) Bess.
Senecio congestus (R.Br.) DC.

Stream channel west end of Colin Lake - CL72
Poa pratensis L.
Scirpus microcarpus Presl.
Urtica dioica L. ssp. gracilis (Ait.) Selander

Colin Lake Centre
July 8
Sheltered shallow water on gull nesting island with Equisetum fluviatile - CL73
Cardamine pratensis L. var. angustifolia Hook.

Edge of birch on gull nesting island - CL74
Antennaria parvifolia Nutt. = A. nitida
Senecio indecorus Greene

South arm - CL75
Potamogeton alpinus Balb.
Potamogeton richardsonii (Benn.) Rydb.

Colin Lake South East Arm
July 11
Quiet bay - CL76
Potamogeton natans L.
Potamogeton robbinsii Oakes

Portage on Colin River, open pine - CL77
Polygonum douglasii Greene
Potentilla arguta Mx.

Colin Lake North
July 11
Stream channel - CL78
Potamogeton alpinus Balb.

Woodman to Colin channel
July 9
Edge of pine woods - WM79
Heuchera richardsonii R.Br.
Achillea millefolium L.

East Woodman channel - WM80
Potamogeton alpinus Balb. (also July 10)
Potamogeton pusillus L.
Potamogeton richardsonii (Benn.) Rydb. (July 10)

South Woodman
July 9
Boggy pool in birch - WM81
Rubus arcticus L.

Sage slope above kettle lake - WM82
Stipa spartea Trin. var. *curtiseta* Hitchc.
Potentilla hookeriana Lehm. = *P. nivea* var. *hookeriana*

Ledum/Picea bog - WM83
Arctostaphylos rubra (R. & W.) Fern.

Unique wetland south of kettle lake - WM84
Equisetum pratense L.
Equisetum scirpoides L.
Triglochin palustris L.
Sparganium angustifolium Mx.
Poa pratensis L. = *P. alpigena*
Carex aurea Nutt.
Carex capillaris L.
Carex curta Good.
Carex ?? (being examined further by experts in *Carex*)
Carex interior Bailey
Carex norvegica Retz. = *C. media*
Eleocharis quinqueflora (Hartm.) Schwartz
Eriophorum brachyantherum Trautv.
Scirpus hudsonianus (Mx.) Fern.

Juncus alpinoarticulatus Ch.
Habenaria hyperborea (L.) R.Br.
Spiranthes romanzoffiana C. & S.
Salix arbusculoides Anders.
Parnassia palustris L. var. montanensis (F. & R.) Hitchc.
Erigeron acris L. ssp. politus (E. Fries) S. & K.

Aspen woods south of kettle lake - WM85
Poa glauca Vahl
Astragalus striatus Nutt. = A. adsurgens

Edge of kettle lake - WM86
Carex diandra Schrank
Eleocharis palustris (L.) R. & S.
Epilobium ciliatum Raf.
Epilobium palustre L.
Myriophyllum exalbescens Fern.
Cicuta bulbifera L.
Senecio indecorus Greene

Edge of wetland by stabilized dune - WM87
Carex rostrata Stokes
Veronica scutellata L.
Galium trifidum L.

Pine burn southwest of camp - WM88
Lycopodium obscurum L.

Cobbly muddy lakeshore by camp - WM89
Viola palustris L.

Granite outcrop in burn - WM90
Agrostis scabra Willd.

North of Woodman
July 10
Muddy shore of third lake north of Woodman - WM91
Ranunculus gmelinii DC.

Edge of sedge stream - WM92
Rumex britannica L. = R. orbiculatus Gray
Cicuta virosa L. = C. mackenziana

Granite crevice north of second lake north of Woodman - WM93
Agrostis scabra Willd.

APPENDIX F: BUTTERFLY OBSERVATIONS

The following collections and observations were made by Norbert Kondla during the July, 1983 field study:

July 2 - Wylie Lake

3 Erebia disa
7 Boloria eunomia
A few Papilio glaucus canadensis observed

July 3 - Wylie Lake

2 Oeneis jutta
1 Erebia disa
1 Celastrina argiolus lucia
1 Boloria eunomia - treed bog
A few Papilio glaucus canadensis observed

July 5 - Colin Lake

1 Speyeria atlantis hollandi - deciduous shrubland
1 Limenitis arthemis rubrofasciata - deciduous
1 Boloria freija - variety of dry habitats
2 Erynnis icelus - deciduous woodland
1 Callophrys augustinus - pine woods
1 Celastrina argiolus lucia - deciduous woodland
2 Oeneis jutta - treed bog
2 Erebia disa - treed bog
3 Oeneis chryxus caryi
Nymphalis milberti, Polygonia gracilis, Papilio glaucus observed in willow and poplar

July 7 - Colin Lake

? Limenitis archippus - most northerly records for Alberta
3 Oeneis jutta
1 Plebejus aquilo - grassy hillside
1 Nymphalis antiopa

Boloria eunomia were very dark, possibly an undescribed subspecies.

MAPS
NOT
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